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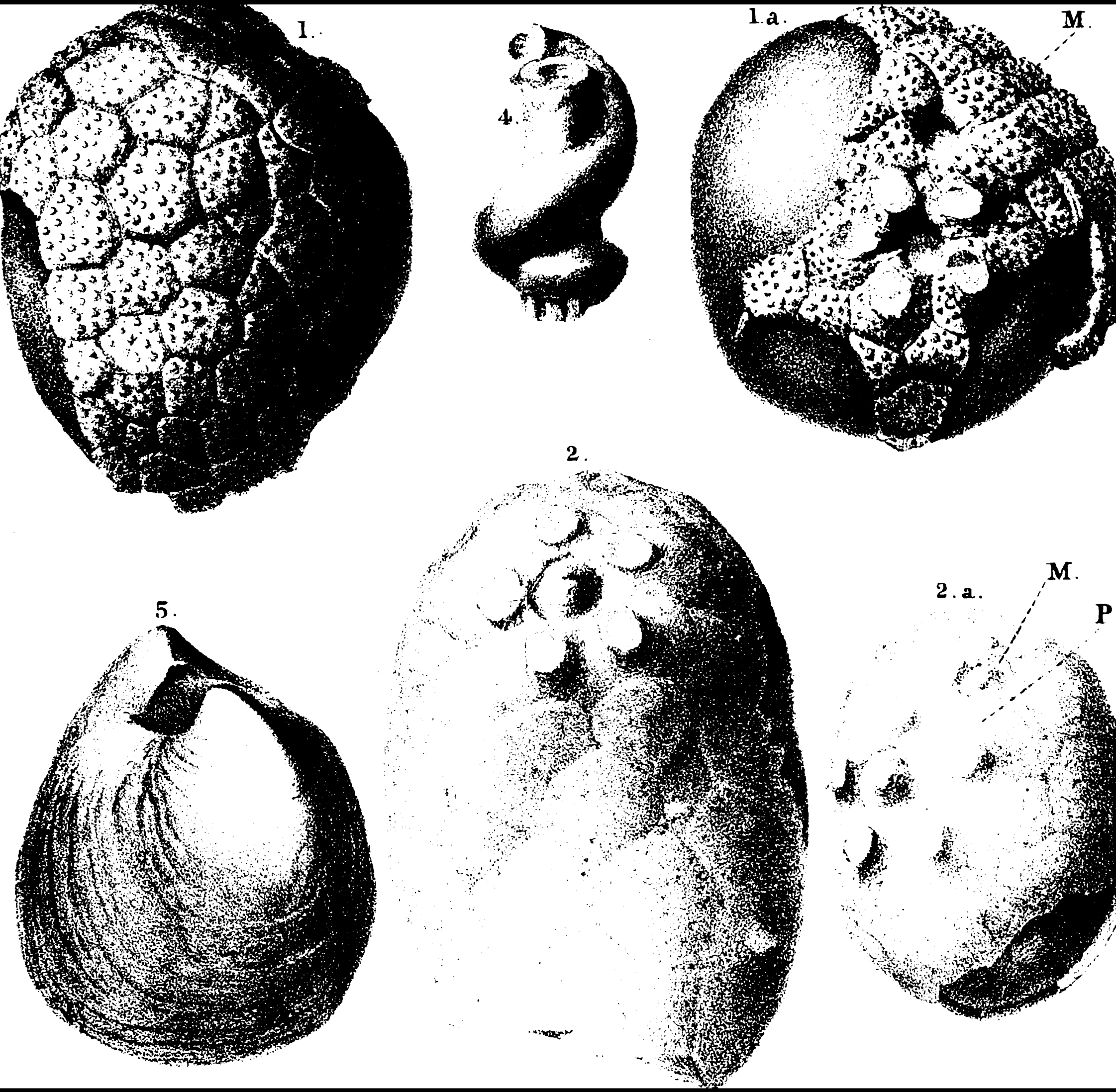

# The Journal of the Cincinnati Society of Natural History

Cincinnati Society of Natural History

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# THE JOURNAL OF THE CINCINNATI SOCIETY OF NATURAL HISTORY.

*PUBLISHING COMMITTEE:*

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THE JOURNAL

OF THE

CINCINNATI SOCIETY OF NATURAL HISTORY.

VOL. 1. CINCINNATI, OCTOBER. No. 3.

## *PROCEEDINGS OF THE SOCIETY.*

The Cincinnati Society of Natural History held its regular monthly meeting, July 2, 1878,—President V. T. Chambers in the Chair. The minutes were read and approved.

The following named persons, having been previously proposed, were unanimously elected to regular membership: C. G. Lloyd, Columbia Street, Newport, Ky.; Dr. Chas. S. Metz, and Charles F. Lowe, Madisonville, Ohio.

L. S. Cotton, Esq., having briefly called attention to the advantages to be derived from the meetings of scientific bodies in our city, offered the following resolution, which was unanimously adopted:

*Resolved,* That a Committee of three be appointed to confer with other Societies and the authorities of this city, to obtain their co-operation in extending an invitation to the *American Association for the Advancement of Science* to hold its annual meeting for 1879 at Cincinnati, and to report to this Society at its next meeting. The Chair named the following members as such Committee, L. S. Cotton, R. B. Moore, and Julius Dexter.

Donations were acknowledged as follows: Flint Arrow heads, from Dr. J. J. Temple; one pair moccasins, one bullet pouch, one bow and one ornamented quill, all taken from a Comanche brave killed in New Mexico, from Dr. H. Ludington; two pamphlets from Hon. M. Sayler; a fine stalactite, from a Cave near the C. S. R. R. Bridge over the Kentucky River, by E. A. Ferguson ; Eggs of Carolina Dove, Upland Plover, and Carolina Rail, from Charles Dury ; Report upon Forrestry, 1877, by F. B. Hough, from Department of Agriculture; Report of the Central Park Menagerie, New York, 1877 ; Monthly Weather Reports from War Department.

Society met August 6th, 1878,—President Chambers in the Chair.

Dr. J. A. Warder read a paper on "The Variation of Leaves." Prof. A. J. Howe, one on "Harvey and the Circulation of the Blood;" and Dr. C. L. Metz, a paper with a map, on the "Prehistoric Monuments of the Little Miami Valley."

Dr. Howe, from the Committee on Course of Lectures, reported progress.

A resolution was adopted inviting the *American Association for the Advancement of Science*, to meet in this city in 1879.

The following donations were received: Eight specimens of *Pentrimites robustus*, and one of *P. pyriformis*, from Charles Dury; one stone ax, from E. O. Ulrich; two hundred and forty-one foreign botanical specimens from Prof. E. S. Wayne; a bird's nest with eggs, from Dr. H. H. Hill; three specimens *Hemiptera*, from J. W. Shorten; one pair of very old moccasins, made of bark thread, found in Saltze's Cave, near Mammoth Cave, Ky.; also specimens of eyeless crabs from Judge Alfred Yaple.

## *OBSERVATIONS ON CINCINNATI BIRDS.*

By Frank W. Langdon.

Since the publication of "A Catalogue of the Birds of the vicinity of Cincinnati,"* by the writer, numerous additional facts relating to the Ornithology of this locality have been brought together, the more important of which form the subject of the present paper.

With respect to the various sources from which these additions have been derived, especial acknowledgments are due to Mr. Charles Dury, of Avondale, well known for his varied accomplishments as a naturalist and collector, who has kindly placed at my disposal a series of notes, embracing interesting observations on upwards of fifty species of Ohio Birds. Want of space will prevent the reproduction here of Mr. Dury's notes in full, and I have, therefore, selected chiefly those relating to species not previously recorded here, or of especial interest for other reasons.

Mr. John W. Shorten, of Cincinnati, Mr. Edgar R. Quick, and Dr. Rufus Haymond, of Brookville, Ind., and the several other naturalists elsewhere mentioned, have contributed notes and information of value.

In the numbering and arrangement of the species, the following notes correspond to the original catalogue.

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* A Catalogue of the Birds of the vicinity of Cincinnati, with notes, by Frank W. Langdon. Salem, Mass., Naturalist's Agency. April, 1877.

3. **Turdus pallasi**, Cab.—*Hermit Thrush.*—Mr. Dury notes a nest and eggs of this species taken here by Mr. G. Holterhoff, May 10, 1877. This is a fact of much interest, as considerably extending the southern limit of its breeding range; the southernmost record previous to this being Massachusetts, where it is only occasionally found breeding, according to Baird, Brewer and Ridgway, in "North American Birds."

4. **Turdus Swainsoni**, Cab.—*Olive-backed Thrush.*—This species, previously given by me as "not common," I have since found abundant in woodland for a few days, in the latter part of September, 1877. They were quite shy, and sought refuge in dense thickets at the slightest alarm, but when all became quiet, they would re-appear and resume their occupations of bathing in a small stream near by, and searching for insects along its banks.

7. **Mimus polyglottus**, Boie.—*Mocking Bird.*—The Mocking bird may fairly be considered a regular, though rare, Summer resident with us, as several instances of its breeding here are reported to me; in some cases the young being taken and reared as cage birds.

13. **Polioptila cærulea**, Scl.—*Blue-gray Gnatcatcher.*—Two nests observed near Madisonville, early in May, 1878. One contained five fresh eggs, on May 7th, and differs from a nest taken by Mr. E. R. Quick, at Brookville, Ind., in lacking the soft, cottony lining; its interior being composed of fine grasses and hair. Both are beautiful structures, built on the upper side of a limb, and covered externally with lichens like the nest of the humming bird. Their situation varies from twelve to fifty feet from the ground.

14. **Lophophanes bicolor**, Bp.—*Tufted Titmouse.*—This species is a constant resident with us, but much more conspicuous in its habits during the Fall and Winter, and therefore *apparently* more numerous at those seasons. One was recently observed by me to alight on a small tree-trunk and deposit something from its bill in a crevice; and on examination I found a good-sized chunk of walnut kernel therein, which remained for two or three days, until wanted, I presume. Dr. Bachman, quoted by Baird, Brewer and Ridgway, relates a similar habit of a specimen kept in confinement by him, and it seems probable that the habit of hoarding food may furnish this and allied species with a considerable portion of their Winter sustenance.

15. **Parus atricapillus**, L.—*Black-capped Titmouse or Chicadee.*—Mr. Dury notes two specimens of this Titmouse, taken by himself in the Winter of 1872-3. It is easily overlooked, as it bears a close resemblance to our common Chicadee (*P. Carolinensis*), which, with good reason, is by some authorities considered as merely a southern variety of *atricapillus.*

22. **Troglodytes aedon**, V.—*House Wren.*—Referring to this species,

Mr. Dury writes that it "has always been very common until the introduction of imported sparrows."—"Only a few seen in Avondale in 1877." Mr. Walter Douglass, of Mt. Auburn, tells me that, in 1875, he took three nests, containing respectively, eight, six, and five eggs ; in 1877, however, he did not see a single specimen.

Its distribution, even before the introduction of the European sparrow, must have been extremely local, as my own identification of the species rests upon a single specimen taken several years ago at Madisonville.

ALAUDA ARVENSIS, Linn.—*European Skylark.* (Not previously recorded.)—Mr. Armin Tenner tells me that this species has become acclimatized in the suburbs of Cincinnati, and that in June, 1877, he found its nest containing young. As Mr. Tenner was familiar with the species in Europe, there can be no doubt of the correctness of his identification, and the birds therefore, is as much entitled to a place in our fauna as is the European sparrow or any other imported species.

30. PROTONOTARIA CITRÆA, Bd.—*Prothonotary Warbler.*—Several specimens obtained at St. Mary's Reservoir (130 miles north of Cincinnati) by Mr. Dury, who also took a nest containing one egg. Although probably a migrant with us, it has not yet been identified in this vicinity.

31. HELMITHERUS VERMIVORUS, Bp.—*Worm-eating Warbler.*—Additional specimens observed. One in June, 1877, by Mr. Dury, which contained an egg ready to lay; others in August, 1877, and in May and June, 1878, at Madisonville.

36. HELMINTHOPHAGA PEREGRINA, Cab.—*Tennessee Warbler.*—In 1877 I found this species literally abundant at Madisonville, from Sept. 8th to 30th, and stragglers were seen until after the 15th of October. Mr. Dury also observed it in large numbers at Avondale. His experience coincides with my own as to its comparative rarity previous to 1877.

In May of the present year I took several additional specimens, but it could not be said to be abundant. Its sharp, shrill song, at this season, resembles that of the Cerulean Warbler, but is more energetic, and merely a repetition of one or two notes, without the peculiar termination of the song of the latter species. Its usual note in the Fall is a faint "tchip," but I have occasionally taken it in full song at that season.

37. DENDRŒCA ÆSTIVA, Bd.—*Summer Warbler, Yellow Warbler.*—A common Summer resident, and, with the exception of *D. coronata,* the first warbler seen in the Spring; making its appearance about the middle of April. A nest discovered on the 2d of June, was situated ten or twelve feet from the ground, in a Quince tree, and contained four well-grown young which completely filled the nest. These young, when

fledged, were of a soiled whitish color beneath, which soon became tinged with yellowish; above ashy green, the primaries and secondaries darker, margined with yellowish. By the 7th of June, they were able to follow the parents in search of food.

40. Dendrœca cærulea, Bd.—*Cerulean Warbler.*—Young taken while following their parents through the tree-tops early in July, 1877.

41. Dendrœca coronata, Gr.—*Yellow-rumped Warbler.*—A very common migrant. Specimens taken as early as March 4th, when small streams were frozen over, and as late as November 29th, during a brisk snow storm. A few individuals may Winter here occasionally, as many do in Southern Illinois according to Mr. Ridgway.

49*a*. Dendrœca dominica, *var.* albilora, Ridgway.—*White-browed Yellow-throated Warbler.*—Specimens of *D. dominica*, from Madisonville, sent to Mr. Ridgway for examination, are pronounced by him to be var. *albilora.* So far as known, the typical *dominica* is confined to the West Indies and South Atlantic coast of the U. S.; var. *albilora* to the Mississippi Valley.

53. Dendrœca pinus, Bd.—*Pine-creeping Warbler.*—Taken by Mr. E. R. Quick, at Brookville, Ind., in May, 1878.

55. Siurus nævius, Coues.—*Short-billed Water Thrush.*—Taken May 10th (1878), at Madisonville. This specimen flew up from a marshy tract in a wheat field, and when first startled, uttered a curious note resembling the "*weep-wit*" of the Solitary Sandpiper, but more subdued.

58. Oporornis formosus, Bd.—*Kentucky Warbler.*—This species has been present in unusual numbers during the past two seasons (1877 and '78). It has, heretofore, been considered as rather a rare bird, but is a regular Summer resident, and doubtless breeds here, although its nest and eggs have not yet been discovered. Dense woods, with an undergrowth consisting chiefly of Spicewood bushes, are its favorite, and so far as my observation goes, its only resorts during the Summer. Its song closely resembles that of the Golden-crowned Thrush (*S. auricapillus*), but lacks its characteristic *sharpness*, the notes being full and rounded.

64. Myiodioctes canadensis, Aud.—*Canadian Fly-catching Warbler.*—Taken in September, 1877, at Madisonville.

66. Pyranga rubra, V.—*Scarlet Tanager.*—The previously expressed opinion that this species probably breeds here, has been confirmed, its eggs having been taken at Glendale by Mr. Bonsal Porter, from whom I have obtained a specimen.

69. Tachycineta bicolor, Cass.—*White-bellied Swallow.*—By an error this species was marked as breeding in my original catalogue. This I desire to correct, as I am only positive of its occurrence here in

the Spring. Mr. Dury, however, notes several nests and eggs taken at St. Mary's Reservoir, where it breeds in "snags and stumps."

76. Vireo philadelphicus, Cass.—*Brotherly-love Vireo.*—Taken at Madisonville, in September, 1877. I am indebted to Mr. J. W. Shorten for another specimen taken in the Spring of 1876, at the same locality.

79. Vireo solitarius, V.—*Blue-headed or Solitary Vireo.*—Specimens in the collections of Mr. Dury and Dr. R. M. Byrnes.

82. Collurio ludovicianus, Bd.—*Loggerhead Shrike.*—This species appears to be more common than usual this season. Two nests have been taken at Valley Junction, by Mr. Harry Hunt, and one at Madisonville by Mr. William Settle, to whom I am indebted for specimens. These nests each contained six young, which were probably hatched about the third week in April. An adult specimen in my collection appears to represent the typical *ludovicianus*, and does not differ appreciably in color from a Florida example, but the bill of the latter is considerably larger, in accordance with the laws of Geographical Variation as elucidated by Allen.*

86. Ægoithus linaria, Cab.—*Red-poll Linnet.*—This and the following species were taken by Mr. Dury, at Avondale, during the winter of 1869-70.

90. Plectrophanes lapponicus, Selby.—*Lapland Longspur.*—A single individual, taken by Mr. Wm. H. Whetsel, at Madisonville, Dec. 11th, 1877, is now in my collection. It has also been taken by Mr. Dury, at Avondale, as above stated.

93. Coturniculus passerinus, Bon.—*Yellow-winged Sparrow.*—Specimens taken by Mr. Dury, who states that it is a rare Summer resident in this vicinity.

95. Melospiza lincolni, Bd.—*Lincoln's Finch.*—Included in "Catalogue Birds Cincinnati" on authority of Dr. Wheaton, who gives it as a migrant in his list of the "Birds of the State, 1874." By an oversight, however, the quotation marks were omitted in the catalogue, and I take the present opportunity to make the proper correction. It has yet to be identified here.

103. Zonotrichia leucophrys. Bp.—*White-crowned Sparrow.*—Mr. Dury notes the occurrence of this species in numbers during *Christmas week*, 1877.

107. Euspiza americana, Bon.—*Black-throated Bunting.*—Dr. Kirtland, in 1838 (*Ohio Geological Survey*), considered the occurrence of this bird in Ohio as "doubtful." It is now one of our most abundant Summer residents, and its monotonous song may be continually heard

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* See "Geographical Variation in North American Birds," by J. A. Allen.—Proc. Boston Soc. Nat. History, vol. xv., p. 212, June 19, 1872.

along fences and hedge-rows, from daylight to dusk, and occasionally even at midnight.

112. PIPILO ERYTHROPHTHALMUS, Vieillot.—*Towhee Finch*, *Ground Robin.*—Mr. O. M. Meyncke, of Brookville, Ind., informs me that several instances of the nesting of this species *in bushes*, have come under his observation. He also found one nest situated on the top of a stump about six feet high, overgrown with parasitic vines.

113. DOLICHONYX ORYZIVORUS, Sw.—*Bobolink.*—Present in limited numbers for a few days in May, 1878.

121. CORVUS CORAX, Linn.—*Raven.*—Dr. Rufus Haymond, in a list of the "Birds of Franklin Co., Ind." (Ind. Geol. Report, 1869), says: "The Raven was once numerous in this section, yet now so rare that I have seen but one during the past twenty years."—In Atwater's History of Ohio (1838), the Raven is mentioned as a constant resident of the State.

146. COLAPTES AURATUS, Sw.—*Golden-winged Woodpecker*, *Flicker.*—Unusually abundant during the Fall of 1877. A beautiful albino has been taken at Valley Junction, by Mr. Harry Hunt, and is now in his collection. It is of a delicate cream color, but the red nape shows plainly, and the pectoral crescent obscurely.

147. CONURUS CAROLINENSIS, Kuhl. — *Carolina Paroquet.* — Mr. Joseph Settle tells me that Paroquets occurred in large numbers near Madisonville, during the Summers of 1837, '38 and '39. Few were seen in 1840, and none after that year. He describes them as a "green bird," appearing in flocks, like Blackbirds, making a loud, chattering noise, and destroying a considerable amount of fruit. Mr. Dury notes, on the authority of Giles Richards, Esq., their occurrence in large numbers at Matson's Mills, near Venice, Butler Co., Ohio; Mr. Richards pointing out the identical sycamores in which they had nested many years ago.

148. STRIX FLAMMEA, L. *var.* AMERICANA, Coues.—*Barn Owl.*—Mr. Dury's collection contains two specimens taken here; the only positive record of its occurrence in Ohio.

151. OTUS VULGARIS, *var.* WILSONIANUS, Less.—*Long-eared Owl.*—Full fledged young of the year taken by Mr. Dury, at Avondale, in July, 1878—the first evidence of the breeding of this species in this vicinity. The stomach of this specimen contained portions of a Robin and two beetles (*Copris carolina*).

SYRNIUM CINEREUM, Aud.—*Great Gray Owl.*—Identified by Mr. Dury in Clark Co., Ohio.

157. CIRCUS CYANEUS, Lacep. *var.* HUDSONIUS, Ridgway.—*Marsh Hawk.*—Mr. Shorten has in his possession an adult female of this species, taken near Covington, Ky., in November, 1877.

158. Nauclerus furcatus, Vig.—*Swallow-tailed Kite.*—A single specimen recorded by Dr. Haymond, in his list of the Birds of Franklin Co., Ind., 1869. (Indiana Geological Report).

167. Buteo pennsylvanicus, Bp.—*Broad-winged Hawk.*—The stomach of a specimen of this Hawk taken at Madisonville, in April 1877, contained the greater portion of the skeleton and hair of a small Wood-mouse (*Arvicola austerus*), a lizard (*Eumeces?*) about six inches long, and ten or twelve small beetles, with numerous elytra of the same. I have also dissected two or three individuals of this species whose eyes were infested with numerous parasitic worms, about three-quarters of an inch in length, which were found in the region of the nictitating membrane, or third eyelid.

168. Archibuteo lagopus, Gr. *var.* Sancti-Johannis, Ridgway.—*Rough-legged Buzzard, Black Hawk.*—Mr. Dury mentions a specimen taken near Clifton some years ago.

175. Zenaidura carolinensis, Bon.—*Turtle Dove.*—A nest of the Carolina Dove was discovered *on the ground* in the Little Miami "bottoms," May 5, 1877, by my brother, Clifford C. Langdon. It contained one young bird and an egg. The nesting of this species on the ground is very unusual in wooded sections, but is said to be of frequent occurrence on the Western plains, owing to the absence of trees. (*Vide* North American Birds, B. B. & R. vol. iii., p. 384-6).

179. Ortyx virginianus, Bp.—*Quail.*—"Bob White" was protected by law in Ohio, from January 1, 1876, until November 15, 1877—nearly two years; and consequently appeared in unusual numbers during 1877. This law was a result of the exertions of the Cuvier Club of Cincinnati, and is the one at present in force, allowing the taking of Quail during only six weeks in the year (November 15 to January 1).

184. Ægialitis melodus, Cab.—*Piping Plover.*—Chiefly confined to the seacoast and Great Lakes. One specimen taken on the Ohio River, near Cincinnati, by Mr. Dury.

194. Ereunetes pusillus, Cass.—*Semipalmated Sandpiper.*—I am indebted to Mr. Shorten for three specimens of this species, taken by him on the Little Miami, near Madisonville, May 25, 1878—the first I have seen from this locality. Two of these are females, and present the curious anomaly of being larger and brighter colored than the male—peculiarities so characteristic of the Phalaropes.*

Whether the duties of incubation are performed by the male, as in the latter group, would be an interesting subject for investigation.

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* See "Biography of Wilson's Phalarope," by E. W. Nelson,—Bulletin of the Nuttall Orn. Club, April, 1877,—Also foot-note by J. A. Allen, *ibid.* p. 42.

214. Tantalus loculator, L.—*Wood Ibis.*—In view of the rarity of this species here, the following account of its occurrence by Dr. Haymond merits repetition:—" These large and curious birds occasionally visit the Whitewater Valley in the month of August. Some years ago, I kept one (which had a broken wing) about six weeks. In that time it became very tame, learned its name and would come when called.

We fed it upon living fish, which it would swallow with amazing rapidity, except catfish, which required labor and time to dispose of. It died from having eaten a Mackerel which had been placed in a basin to soak."*

218. Ardea candidissima, Gmelin.—*Little White Egret.*—Mr. Dury notes the capture of a specimen on the Reading Road, near Avondale, several years ago.

221. Nyctiardea grisea, Steph. var. Nævia, Allen.—*Night Heron, Qua-bird.*—A fine male of this species, taken near Covington, Ky., in April, 1878, has been placed in the museum of this Society through the kindness of J. W. Hall, Jr. It is a bird of very unusual occurrence in this vicinity, although exceedingly abundant in many localities, East and North, during the breeding season, and a common resident in the Southern States. It is said to breed in some parts of Ohio, and its rarity in this portion of the State is doubtless owing to absence of the swampy woods which are its favorite breeding resorts.

223. Ardetta exilis, Gr.—*Least Bittern.*—Through Mr. Shorten, I learn that a specimen of this diminutive Heron was picked up alive in the streets of Cincinnati, in September, 1877.

224. Grus americanus, Ord.—*Whooping Crane.*—Additional specimens of this magnificent bird are reported; one, in the collection of Mr. Lucius Curtis, taken near Carthage (Dury); another, taken May 30, 1877, at West Elkton, Preble county, Ohio, by Dr. W. C. Robertson (Shorten).

236.—Anser albifrons, Gm. var. Gambeli, Coues.—*American White-fronted Goose.*—Specimen shot near Miamitown, Ohio (Dury).

261. Pelecanus trachyrhynchus, Lath.—*White Pelican.*—Of occasional occurrence on the Ohio river during the migrations, and I learn of the capture of three or four specimens in as many years. Dr. J. H. Hunt has seen a specimen in the gray or immature plumage, taken at the mouth of the Great Miami.

262*a*. Graculus dilophus, var. floridanus, Coues.—*Florida Cormorant.*—Mr. Dury has favored me with an exceedingly interesting account of the former abundance of this species at St. Mary's Reservoir, in which he says: " On the south side of the Reservoir, about seven miles from Celina, was the 'Water Turkey' Rookery. Here I used to go to shoot them, with the natives who wanted them for their feathers; I have helped kill a boat load."

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* **Indiana Geol. Survey, 1869.—Birds of Franklin Co., page 229.**

" One season I climbed up to their nests and got a cap full of eggs. The nests were made of sticks and built in the forks of the branches. The trees [which were all dead] were mostly oaks, and covered with excrement. I found from two to four eggs or young to a nest. The young were queer little creatures—looked and felt like india rubber." " The old birds flew around in clouds, and made their croaking notes, indicative of their displeasure at my presence." " Some of the trees had ten or twelve nests on them." " As the timber has rotted and blown down, the birds have become less and less numerous."

The above circumstances occurred during the month of June, 1867, since when, as Mr. Dury states, these birds have rapidly decreased in numbers. The many specimens examined by him were, without exception, *var. floridanus.*

My own observation of the species in Ohio is limited to a single specimen found floating in the Reservoir late in October, 1874, when its comrades had probably migrated. It has also been tolerably well identified on both Miamis during the migrations.

The St. Mary's Reservoir, alluded to in the foregoing notes, is a point of much interest, ornithologically, and a brief account of its main features may not be out of place in this connection.

This Reservoir, which is in reality a flooded wilderness, is an artificial body of water, eight miles in length, by from two to four miles in breadth, covering an area of about 17,000 acres of original forest and prairie in nearly equal proportions. It is situated about one hundred and thirty miles north of Cincinnati, in Mercer and Auglaize counties, and supplies the Miami Canal.

The construction of the Reservoir was begun in 1838, and completed about the year 1845, by throwing two parallel banks of earth, about eight miles apart, across a shallow valley lying east and west. It receives its principal supply from two small streams flowing through this valley, and its situation is such that one of these streams eventually reaches Lake Erie, through the St. Marys and Maumee rivers, while the other finds its way into the Ohio river by way of the Wabash. It is at once apparent that the creation of a body of water of this size, so peculiarly situated, and in a region possessing no natural lakes, can not fail to materially affect the bird-fauna of a large portion of the State, and although not, technically speaking, within the scope of the present paper, I have included some of Mr. Dury's observations at that locality, as possessing a special interest.

*July* 6, 1878.

# *THE PREHISTORIC MONUMENTS OF THE LITTLE MIAMI VALLEY.*

By Charles L. Metz, M.D.

The aboriginal earthworks in this vicinity are so rapidly becoming more and more indistinct, from the effects of continued cultivation, the elements, the leveling of many for building sites, and the carting away of others for the purpose of making fills and grades, that in a few more years their sites will be obliterated and forgotten.

This has determined me to prepare a chart, giving the location of the works, and mounds, in Columbia township, and of those in Anderson and Spencer townships, situated near the Little Miami River.

They are principally situated in Groups, and are marked respectively, A, B, C and D, on the chart.

## Group A.

Is situated partly in section 9, and partly in section 15, Columbia township, Hamilton county, Ohio, one mile west of Plainville station, on the Little Miami Railroad, and on the second bottom or plateau of the Little Miami river, on a narrow sandy ridge of a reddish color.

This ridge has an elevation, averaging from 10 to 25 feet above the general level of the plateau on which it is situated. It lies between the Wooster Turnpike, and the Little Miami Railroad and River, elevated about 200 feet above the latter. On this ridge the principle work of this group is situated.

Commencing at the east end of the ridge, and in a wood known as "Stites Grove," we find an earthwork (Group A, No. 1) consisting of a circle, central tumulus, and an oval-shaped tumulus impinging on the outer southeast edge of the circle. The following extract, from an article entitled "The Mound Builders," by Mr. Florien Giauque, published in the *Harvest Home Magazine*, August, 1876, describes this work as follows: "In the grove known as the 'picnic woods,' owned by Mr. Charles Stites, of Columbia, and on the top of this ridge, there is a circular enclosure, made by a ditch, and an earthen embankment outside of and immediately adjoining this ditch, and no doubt made of the material which was taken from it. From the bottom of this ditch to the top of the embankment, the present height is about 5½ feet; the diameter of the ditch from deepest cut on either side is 75 feet; the enclosing embankment, from crest to crest, is 105 feet; and the diameter of the entire work from outside to outside is about 145 to 150 feet. On the east, this embankment is enlarged into a regular mound, about 48 feet in diameter, and about 6 feet high above the adjacent ground. At the southeast part of the enclosure, there is left an entrance way about 10 feet wide—that is, there is here neither ditch nor embankment —this entrance faces and is about 40 feet away from the edge of the terrace or bluff, which is here quite steep, and about 100 feet* (estimated) high above the river, which is here quite near the foot of the bluff. The edge of the terrace and ridge coincide here."

The ridge to the east of this work slopes gently until it reaches the general level of the plateau. On this slope numerous relics are found.

The above described work was explored by Mr. Giauque and others, and several fine relics were found. The finding of one he describes as follows:

"One of the trenches was begun about the north of the mound, and the writer (Mr. Giauque), while working here, hardly a foot below the surface of the mound, and about 7 feet from the centre of it, found a very fine relic. It is a tube 6 inches long, a little less than an inch in diameter, made of crinoidal limestone, highly polished, though somewhat coated and discolored in places by the oxide of iron which has collected on it during its long burial. The hole extends entirely through from end to end, but grows rapidly smaller near one end, being about ⅝ths inch in diameter most of the distance, and about 3-16ths of an inch at the smaller end. This relic is in fact a cylinder for about 4¼ inches of its length, to a diamond shaped perforation."

I have measured the circumference of some of the larger trees growing on this work; an oak has 9½ feet, beech 8½ feet in circumference on the central tumulus, maple 6 3-10 feet, an oak 6 7-10 in circumference. North west of this work, and about 200 feet distant, at the foot of the sand ridge, and on the general level of the plateau, is a mound (Group A, No 2), which has been recently explored. Its diameter east to west is 45 feet, elevation 7 feet. An oak tree on its western slope has 8 7-10 feet, and a beech on its eastern slope 5 feet of a circumference. An interesting account of the exploration of this mound, by Mr. Giauque, was published in the *Harvest Home Magazine*, in the article from which I quoted above. The circumstances of the exploration are of considerable interest to the archæologist, and I make the following extracts from Mr. Giauque's article:

* * "About 11 feet from the outside, and 2 feet above the original surface, the shovel hitherto working pretty freely in clayey sand, struck the first big stone. It was a flat limestone, possibly brought from the neighboring hill, about half a mile away, as there were none nearer, and it was much reddened and softened by fire, the fossil shells in it being whitened, or more nearly calcined than the other parts. This, together with charcoal and ashes, pieces of bone, pieces of bowl-

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* **The bluff is here 200 feet high.**

der broken by fire, were very encouraging indications of a 'find.' Further digging showed that the rock struck was a part of a stone arch, rudely made of undressed limestone. * * *

"That part of the arch first found was removed, and under it was found a skeleton, the *tibia* (shin bone) being the first part of it discovered. The arch was then entirely uncovered, the earth removed between it and the skeleton, and the skeleton taken out. * * If the mound had been divided into four parts, by drawing a line through its centre from north to south, and another similarly from east to west, the arch would have been entirely within the northwest section of the mound, and the skeleton which it covered, lay with its head nearly towards the northeast (N. E. E.) Perpendicular sections of the mound, as dug away that day, showed from the bottom upwards.

"1. The skeleton resting on or near the original surface, which was a sandy clay, quite compact and hard.

"2. About a foot of sandy earth, possibly mixed with ashes, but no charcoal nor pieces of bowlder nor bone; and especially in places where the rock above had relieved it from pressure, quite loose and soft.

"3. The arch, hitherto so called for convenience, but perhaps hardly entitled to the name. This was made, as has been said, of undressed but flat limestone, averaging about 20 to 30, and 6 to 8 inches in length and breadth; 4 inches in thickness, and approximately most of them being about a medium between these extremes; the arch was about 7 feet long, and 5½ or 6 wide; its highest part being in a line with, and directly over, the body, and arching downward on either side till its edges on the right and left of the skeleton nearly reached the clay on which the skeleton lay. But the stones were not set up on edge, so that the structure, while really an arch in form, was probably not self-sustaining. * * * It contained three layers of stone, one over the other, making about a foot in thickness.

"4. A thin layer of sandy earth, about one inch on the highest part, and increasing in thickness toward the sides.

"5. Charcoal and ashes, the charcoal not plenty, nor in large pieces, this indicating that the fire had burned out before being covered up with earth. This fire was hot enough to color all the top rocks, as mentioned of the first one found.

"6. A layer of sand, about 15 inches thick, with pieces of fire-cracked bowlder, burnt limestone, and pieces of human bones, much decayed —or were they partially burned ?

"7. Another layer of charcoal and ashes similar to the one below, about ¾ths of an inch thick.

"8. Clayey sand to the top, so soft as to be shoveled without loosening with a pick, and nowhere over 2½ feet thick. * * No ornaments or implements of any kind were found in this mound."

West and to the south of this tumulus, and on the same continuous sand ridge mentioned above, are four or five elevations or tumuli, with an average height of three to four feet, being from two to three hundred feet apart (Group A, No. 3). The ridge is here under cultivation, numbers of relics, flint chips, and broken bowlders, are ploughed up on this ridge.

Northwest of those tumuli, and on the general level of the plateau, ¼ mile distant, is a mound (Group A, No. 6), which has a circumference at base of 200 feet, and an elevation of 7 feet; it is as yet unexplored, but cultivated annually.

Four hundred yards to the northeast of this mound, and at the junction of the Wooster and Madison turnpikes, can yet be traced a circular work, which has a circumference of 600 feet (Group A, No. 7). 20 years ago, I am told by an old settler, that the circle had an elevation at that time of three feet,and that there was a mound four feet high in the centre; at present it is almost obliterated. Its northern side in places has an elevation of eight to twelve inches. On the south and eastern side, the work can be traced by the yellow color of the soil. The northeast side is occupied by the Madison turnpike.

Continuing on to the southwestward of the small tumuli, and along the previously described sand ridge, we come to what is known as the "Pottery Field" (Group A, No. 4). Here the ridge slopes gently to the south and southeast, with an elevation of from 60 to 80 feet above the level of the Little Miami river. This field is a plateau of about four acres in extent, sloping back to the higher ground. On this plateau, fragments of pottery are found in great abundance. Flint chips, arrow points, broken bowlders, burnt limestone, and the shells of the fresh-water muscles (*unio*) are found all over the surface. Human remains have been found in the adjoining ravines, and on the slopes; the graves were isolated and shallow, and the method of burial was not uniform. Bones of various wild animals are also found.

Two hundred yards north of the pottery field are several small tumuli (Group A, No. 5); the largest has a circumference at base of about 100 feet, height 5½ feet; this mound has been dug into, but not yet explored. The pottery field, and also the tumulus (Nos. 4 and 5) are situated in section 9, Columbia township, in what is known as Ferris' woods, in "Still Home Hollow." The largest trees on the pottery field measure as follows: A walnut, 15½ feet in circumference; an oak, 12 feet in circumference; a maple, 9½ feet in circumference; and an elm 12 feet in circumference.

A quarter of a mile farther west, in section 15, on the estate of Joseph Ferris, and just southeast of the family homestead, is a circular work, with an inside ditch and a central elevation. Its circumference is about 200 feet; diameter from east to west, about 65 feet. This work is almost obliterated. It is distant from the river half a mile, and elevated above it about 80 feet (Group A, No. 8).

### GROUP B.

The works comprising this group are situated, part in Sects. 15 and 21, Columbia township, and part in Sects. 14 and 20 of Spencer township. Immediately south of Red Bank station, L. M. R. R., commences a gravely ridge, having an average elevation of about 40 to 50 feet above the general level of the surrounding plateau, and extending in a southwesterly direction for three fourths of a mile along the course of the Wooster turnpike. On this ridge, and on the estate of Dr. O. M. Langdon, we have a tumulus (Group B, No. 1) and a circular excavation. The tumulus has an elevation of nine feet,and a circumference of 200 feet at base. It has not been explored, and is covered with young forest trees. 300 yards southwest of this tumulus, is the circular excavation (Group B, No. 2). Its diameter north to south is 40 feet, east to west 44 feet. depth 7 feet. An old settler related that 50 years ago remains of stakes or palisades could be seen surrounding this excavation. The southeast slope of the ridge near this excavation, is covered with huge conglomerate masses, under which are two small caves (Group B, two asterisks)—no evidence exist about them as to their having served as habitations.

Half mile west of this ridge is an elevated plateau sloping to southward, until it coincides with the first bottom of the Little Miami River. On this plateau, at its highest elevation just south of the Little Miami Railroad, and at the junction of Oak and Elmwood Avenues of the Linwood Land Co's. subdivision, was a mound (No. 3, Group B), recently removed in the grading done by the Land Co. The superintendent of the grading, informs me that there were two circular layers of human remains, one near the general level of the ground, and one three feet above the lower one; he gives its height as eight feet, and its circumference at base of 200 feet. The Hon. Judge Cox states to me that this mound was enclosed by a circular work that had a diameter of 800 feet.

South of this mound, distant 200 yards, was a mound which was explored 50 years ago (site marked by an asterisk). My informant, Mr. Riggle, remembers that in a kind of a stone coffin, as he describes it, were two skeletons lying side by side, with their feet to the east, and that their faces were covered with layers of mica.

The five acres west of those mounds, are known as the "Indian Burying Ground" (Group B, No. 4), now subdivided into lots by the Linwood Land Co. The square bounded by Elmwood, Walnut, Oak and Maplewood avenues, covers the greater part of the ancient cemetery, and an excavation made anywhere within or near those boundaries will reveal human remains. The inhumation was usually at length, with head to east.

A short distance east of the Linwood Station, on the south side of the railroad, can yet be seen a portion of a mound remaining. This mound was removed to make way for the L.M.R.R. (Site marked by an asterisk.) Many relics were found in grading down these mounds, and leveling the ground over the cemetery, and are in the collections of Dr. H. H. Hill, and J. J. Hooker, of Cincinnati, and of the writer and others.

The hill northwest of Red Bank station, and distant about two hundred yards from it, has an elevation of about 150 feet. This hill is terraced on its eastern and southern slope; the terraces are five in number, and are undoubtedly the work of human hands. On the top of this hill is a mound (Group B, No. 5); its present elevation is about four feet, and has not been explored.

Southwest of this mound, and at about the same elevation known as "Linwood Hill," distant about 400 yards, is the site of a mound (marked by an asterisk, Group B); it has been graded down. I could learn nothing positive as to its dimensions; the Anderson house occupies its site. Still farther westward, a quarter of a mile distant, and at the same elevation on the Land Company's property, is a mound (Group B, No. 6) four feet high, and a circumference of 150 feet. It has not been explored.

One half mile north of Red Bank station, on the second bottom or plateau of Duck Creek, immediately southwest of the western end of the Cincinnati & Eastern Railroad trestle, is a mound eight feet high, and 200 feet in circumference at base (Group B, No. 7). It has not been explored, but is cultivated annually. Half mile to the northwest of this mound is another, with an elevation of five feet, and circumference of about 175 feet. It is on the same level as the foregoing one, and on the lands of the Dr. Duncan estate (Group B, No. 8).

### GROUP C.

Is located altogether in Anderson township, and principally along the Batavia turnpike, commencing at Dry Run, and at a point where the turnpike crosses it. Coming west on the first bottom of the creek, and but a few yards distant from it, on the north side of the turnpike, is a mound. Its present height is eight feet; circumference at base, 250 feet. It is of very regular shape (Group C, No 1), and well preserved.

Ascending to the second plain or bottom of the river valley, which here has an elevation of thirty to forty feet above the first bottom, and is formed of drift gravel extending along towards the southwest for three quarters of a mile, and running back to the base of the hills. On this plain, and on the north side of the turnpike, in a line with the first mound described above, are three mounds about 200 feet apart (Group C, Nos. 2, 3, 4). Nos. 2 and 3 have an elevation of about four feet. No. 4 has an elevation of ten feet, with a circumference of 250 feet at base. Neither of these have been explored; Nos. 2 and 3 are cultivated annually. South of the turnpike, and on the same level, are two mounds (Group C, Nos. 5 and 6); the largest, No. 6, has a height of five feet, and No. 5 a height of three and one half feet above the general level of the plain.

Four hundred yards southwest of the last two mounds, and on the same level, on the lands of the Martin estate, is situated the "big mound." This is the largest mound in this vicinity, and in the county. Its present elevation is about 39 feet, with a circumference of 625 feet at base (Group C, No. 7). It has been cultivated for the last thirty years, with the exception of the last two years, and is now overgrown with blackberry bushes. It was at one time covered with forest trees; a large oak on its top had a diameter of four feet; this I have from reliable authority. It has not been explored; the proprietor desires to let the dead rest, as he expresses it.

West of this mound, 300 yards distant, is a small mound annually cultivated, and now about three feet high (Group C, No. 8); north of this last mound, and on the first bottom of the Miami River, are the remains of a mound, this was cut away in the building of the turnpike (its site is marked by an asterisk). Bones and relics were found at the time, but I could learn nothing more than that fact. Continuing westward we reach the Odd Fellows' Cemetery at Newtown; in this cemetery is a mound (Group C, No. 9), with an elevation of ten feet; circumference at base 210 feet; it has not been explored. 300 yards northwest of this mound, on the Plainville road, was a mound; it has been recently removed, its material being used for the purpose of making a fill on the road. It contained bones, charcoal, etc., but not much attention was given it by its destroyers. It had a height of about seven feet, and a circumference of 150 feet (Group C, No. 10). Directly in front of the old M. E. Church, in Newtown, was a mound; it was removed, and the material used in the construction of the Plainville road (site marked by an asterisk). 3-4 mile south of Newtown, on the Clough Creek, Newtown road, on the lands of Col. Jewett, is a mound 15 feet high, and a circumference at base of 225 feet; it has not been explored (Group C, No. 11).

Mound No. 12, of this Group, is situated half a mile east of the Union Bridge, on the Batavia turnpike, and immediately in front of the old Turpin homestead. It has been much reduced in size; its present elevation is ten feet; its circumference, 175 feet at base.

## GROUP D.

Nos. 1, 2, 3, 4, 5, of this Group, are situated in Anderson township, and on the lands of Mr. Michael Turner. Nos. 6, 7 and 8, of this group, are on the opposite side of the river, in Sections 29, 28, 23, 22, of Columbia township. No. 1 is the largest and most interesting work in the Miami Valley. An extract from an article by T. C. Dale, or Day, in *The Antiquities of the Miami Valley*, published in the November number of the *Monthly Chronicle*, in 1839, is as follows : "The site of this stupendous fortification, if we may so call it, is a few rods to the right of the road leading from Newtown to Milford, and about midway between them. It is situated on a ridge of land, that juts out from the third bottom of the Little Miami, and reaches within 300 yards of its bed. From the top of the ridge to low-water mark, is probably 100 feet. It terminates with quite a sharp point, and its sides are very abrupt, bearing evident marks of having once been swept by some stream of water, probably the Miami. It forms an extremity of an immense bend, curving into what is now called the third bottom, but which is evidently of alluvial formation. Its probable height is forty feet, and its length about a quarter of a mile before it expands out, and forms the third alluvial bottom. About 150 yards from the extreme point of this ridge, the ancient workmen have cut a ditch directly through it. It is thirty feet in depth, its length, a semi-circular curve, is 500 feet, and its width at the top is eighty feet, having a level base of forty feet.

At the time of its formation, it was probably cut to the base of the ridge, but the washing of the rains has filled it up to its present height. Forty feet from the western side of the ditch is placed the low circular wall of the fort, which describes in its circumference an area of about four acres. The wall is probably 3 feet in mean height, and is composed of the usual brick clay, occasionally intermixed with small flat river stone. It keeps at an exact distance from the top of the ditch, but approaches nearer to the edge of the ridge. The form of the fort is a perfect circle, and is two hundred yards in diameter. Its western side is defended with a ditch, cut through the ridge in the same manner as the one on the eastern side. Its width and depth is the same, but its length is greater by two hundred feet, as the ridge is that much wider than where the other is cut through. The wall of the fort keeps exactly the same distance from the top of this ditch as of the other, viz., forty feet. Its curve is exactly the opposite of that of the other, so as to form two segments of a circle. At the southeastern side of the fort there is an opening in the wall thirty-six yards wide; and opposite this opening is one of the most marked features of this wonderful monument. A causeway extends out from the ridge about

300 feet in length, and 100 feet in width, with a gradual descent to the alluvial bottom at its base.

The material of its construction is evidently a portion of the earth excavated from the ditches. Its easy ascent and breadth would induce the belief that it was formed to facilitate the entrance of some ponderous vehicle or machines into the fort. To defend this entrance they raised a mound of earth seven feet high, forty wide and seventy-five long. It is placed about 100 feet from the mouth of the causeway, and is so situated that its garrison could sweep it to its base. The whole area of the fort, the wall and causeway, are covered with large forest trees, but there is not a tree growing in either of the ditches, and there are but a few low underbrush on their side.

At present the circular wall is almost leveled, but can be readily traced by the color of the soil, and the large number of flat river stones. The ditches can be easily recognized. The mound is still prominent. It measures now, height 5½ feet, diameter 25 yards, circumference 75 yards. The causeway is cut through by the C. & E. R. R., the forest cut away, and the soil cultivated annually.

No. 2 of this Group is a large, circular embankment, with a diameter of about 125 yards. The material forming the embankment is evidently taken from within the enclosure. This work is a perfect circle, with an opening or gateway thirty feet wide to the south. It is about 300 yards distant from the first work of this Group. Two hundred yards to the south of this circle are two mounds, No. 4 on chart being the larger. It has a circumference at base of 250 feet, and an elevation of twelve feet. One hundred and fifty yards east of these mounds is another of very regular shape (Group D, No. 5, on chart); height, four feet, circumference, 150 feet. No. 6 of this Group is a small mound, situated in Section 22, Columbia township, on an elevated ridge known as Gravelotte, on the estate of T. R. Biggs. It is situated in a corner of a large embankment. Its height is 3 feet, circumference 150 feet. No. 7 of this group is located in section 29, Columbia township, ¼ of a mile west of Camden, just south of the Wooster turnpike. It is now only one third its former size, it being partly removed in the construction of the Wooster turnpike. Its present dimensions are, height nine feet, diameter seventy feet. In the southeast corner of Section 29. at the village of Camden, and 300 feet east of the south line of Mr. Galloway's residence, is the corner of an embankment which extends east and south to the river. It extends ⅞ths of a mile east, until it reaches the bank of the river, which is here about 40 feet high, the other running south until it reaches the edge of the gravel ridge, and then runs east to the river. It incloses from 800 to 1000 acres of ground. This embankment, 50 years ago, was six feet high and twelve feet wide. It is now scarcely trace-able, and is best discoverable in spring time, and just after ploughing, when it can be readily traced across the fields by the peculiar color of the soil.

In Section 30, Columbia township, on the lands of Mr. K. Bonham, is a mound, 8 feet high, and 200 feet circumference at base. In Section 34, on Norwood Heights, is located a mound that commands an extensive view of the surrounding country. Its height is nine feet, circumference 200 feet. It was probably a mound of observation.

Other mounds and earthworks will doubtless be discovered in this vicinity, as the forests are cut down, and the ground cleared; and those described and located in the present paper are but a few in the long chain of works extending up along the course of the Little Miami and the East Fork valleys.

In conclusion, I would say that to Mr. Chas. F. Low, Mr. Archer, of the Marietta & Cincinnati R.R., and to Mr. W. R. Kemper, my warmest thanks are due for their assistance in preparing the accompanying chart, and to Mr. F. W. Langdon, who kindly assisted me in carrying out investigations. To the archæologist a complete and speedy examination of this whole valley is of the utmost importance.

MADISONVILLE, HAMILTON Co., O., August 7, 1878.

## *THE MOUND BUILDERS ON THE LITTLE MIAMI.*

By S. S. SCOVILLE, M.D.

In this communication, we call attention to some of the traces of this people, which may be observed along the Miami, from Foster's Crossing to Waynesville. At the former place, on the west side of the river, we have an Earthwork. At Deerfield, or South Lebanon, may be seen another, with adjacent mounds. One mile above South Lebanon, mounds are found which yielded lately some magnificent copper axes, and other interesting relics. In the vicinity of Morrow are mounds. At Fort Ancient, we have an Earthwork that rivals in grandeur anything to be found in Southern Ohio. Opposite this work, we have a terraced roadway, which may be traced for a quarter of a mile or more. Above Fort Ancient, two or three miles, and on east side of river, a terrace may be observed on the side of the hill. Above Freeport, two miles, on east side of the river, is to be seen the site of a town or dwelling place. Here, pottery was manufactured. Nearly a hundred human skeletons have been found and fragments of pottery are abundant. Mounds are found here. Between Freeport and Waynesville is an Earthwork. At the latter place are numerous mounds.

## *DESCRIPTION OF EIGHT NEW SPECIES OF HOLOCYSTITES FROM THE NIAGARA GROUP.*

By S. A. Miller.

Prof. James Hall, of New York, in 1864, founded the genus *Holocystites*, and described four new species, and referred two previously defined ones to the new genus. The next year, Winchell and Marcy described another species. All these were casts.

The genus was defined as follows: "Body elongate, sub-cylindrical, elliptical or sub-ovate, composed of numerous (six or more) ranges of comparatively large plates, or of alternating series of large and small hexagonal or polygonal plates; apertures at or near the summit, one of them central or sub-central, the other eccentric;. supported on a short pedicel; sessile arms, none; free arms, unknown; no evidence of pectinated rhombs."

We now propose to define eight new species of *Cystideans*, and refer them to this genus. They are all well preserved, and show fully the characters of the plates.

The following characters are possessed in common by these species, to wit: free arms, surrounding an ambulacral orifice; a mouth, eccentric or removed to the side; and all the plates of the body poriferous. Calling the side upon which the mouth is situated the ventral side, it will be noticed that the dorsal side is always the most ventricose.

Some of the species possess a third opening, which is called the anal aperture, and in three species, at least, this is found between the mouth and ambulacral orifice. All the species were possessed of columns, except, probably, *H. brauni*. We have illustrated part of the section of a column, showing the radiating lines upon the face of the plates, and two roots. One of the roots is coiled around a column, and terminates without branching, showing that it may have been a floater; the other terminates in clumsy branches. This genus would, therefore, seem to include species that were sessile, floating, or which possessed a column, and attached by branching roots to foreign objects. We have other roots, columns, and undescribed species from the same rocks, that may be illustrated in a future number of the Journal, and throw further light upon the subject.

The remarkable perfection of the specimens and their scientific importance, will justify a short statement of the history of their discovery. The credit of first discovering them is due to the zealous and indefatigable palæontologist, Mr. Fred. Braun. More than a year ago, he collected a number of specimens in the lower part of the Niagara Group, in Jefferson county, Indiana. They were found less than seventy-five feet above known exposures of the Hudson River Group. Last summer, Mr. Braun and I collected, near Osgood, in Ripley County, Indiana, within less than thirty feet of the Hudson River Group (top of the Cincinnati Group) several species of these large *Cystideans*, with many roots and columns. As soon as opportunity occurs for illustrating these, more of them will be described. Later, Prof. A. G. Wetherby collected, near Osgood, several species in the same range, and within 30 feet of the Lower Silurian rocks. We are not informed as to the place where Dr. Washburn found his specimen, farther than it was some distance below the range of the Waldron beds. The plates of *Cystideans*, from the same range of rocks, at Dayton, Ohio, have been known for many years.

Associated with these *Holocystites*, in Ripley County, Indiana, I collected *Lichenalia concentrica*, *Calymene niagarensis*, *Orthoceras annulatum*, *Atrypa reticularis*, having the same characters as the Waldron specimens, and other fossils of the Niagara Group. I have been unable to find any indications of the existence of the Medina or Clinton Group, at any of the exposures examined, and from the observations made, and fossils collected; am fully convinced that the Niagara Group rests directly upon the Hudson River Group of rocks, all the way from Dayton, Ohio, in the meandering course of the exposure across the south-eastern part of the State of Indiana, to the Ohio river. It is true, that I have not traced out the line of junction of these two Groups the whole distance, nor the greater part thereof, but I have seen exposures, where the Groups come together, and have collected fossils in the rocks of both Groups, at a great many places near the line of junction. Moreover, the rocks have never suffered much disturbance, and have a very uniform westerly and north-westerly dip. In short, I have the utmost confidence in the correctness of the view expressed, notwithstanding the statement, which has been made, to the effect, that the Clinton Group intervenes. Certainly no one will have any doubt about the age of the rocks in which these fossils were collected.

HOLOCYSTITES BRAUNI, n. sp. (Plate V., fig. 1, natural size.)

The species is founded upon a single specimen, half of which is buried in a slab.

The body is elongate-subovate, apparently slightly constricted immediately above the junction with the column. The part of the column preserved is very large, and there are some appearances that render it possible that it is all preserved; that the species was sessile and rested close upon its support; and that the apparent constriction is caused by the expanding support or flange.

The basal (?) plates are, in part, anchylosed, which prevents a correct determination of the number. Above these, the first range consists of more than twenty plates. The number cannot be exactly ascertained, but four undisturbed plates, shown in the illustration, cover ⅝ths of an inch, where the circumference of the specimen is 3¼ inches. The plates are longer than wide, vary much in width, are somewha twedge-shaped, and arranged alternately; two of them are hexagonal and the other two are pentagonal. The second range consists of the same number as the first. Nine plates, in place, extend 1⅝ inches, where the circumference, if preserved, would be 3½ inches or more. These plates have no uniformity in shape or size; they are longer than wide, and vary from pentagonal to heptagonal. Above the second range the plates are not disposed with any regularity; they differ in size from ⅛th to ⅜ths of an inch, and vary, in form, from a triangle to a nonagon. If the plates were placed in ranges, there would be about ten between the basals and the first arm base or tentacle. Two strong arm bases are shown on the specimen. The apertures are unknown. The plates are perforated by numerous pores, having no order in their arrangement. The specimen has a length of 3 inches; diameter in the middle, 1¾ inches, and at the base ⅞ths of an inch.

Collected by Frederick Braun, Esq., in whose honor the specific name is proposed, in the lower part of the Niagara Group, in Jefferson County, Indiana.

### HOLOCYSTITES WETHERBYI, n. sp. (Plate V. figs. 2, 2*a*, 2*b*.)

Body sub-globose, or somewhat obovate; summit depressed convex; greatest diameter above the middle and at right angles to a line passing through the mouth and ambulacral orifice. The ambulacral orifice is surrounded by at least four arms (the specimen does not show the arm bases distinctly). The mouth is on the summit, but little removed from the ambulacral orifice. The other openings, which appear upon the summit, and are shown in the illustration, served some purpose not understood. The body is surrounded by four ranges of sixteen plates each. The two middle ranges are composed of hexagonal plates; the other two seem to be composed of both pentagonal and hexagonal plates; the plates are longer than wide. The plates upon the summit are not determined. There is a row of basal plates below the four ranges, composed, probably, of only eight plates, but the lines are too indistinct to allow them to be traced.

Each plate of the body is perforated with small holes, arranged in pairs, but we have been unable to detect any order in the arrangement, except so far as their arrangement in pairs is concerned. The anal aperture, if it existed, is unknown.

One of the supposed arms or tentacles is lying upon the summit of the specimen illustrated. It has a length of one fourth of an inch, and tapers to an obtuse point. There are twenty-five distinct annulations shown upon it. The magnified view is intended to show these annulations. The column was evidently small.

Length of specimen one and six tenths inches; length of four ranges of plates on the anterior side, one and one tenth inches; breadth of same plates, eight tenths of an inch; greatest circumference, four inches; greatest diameter, one and four tenths inches.

Collected by Prof. A. G. Wetherby, in whose honor the species is named, in the lower part of the Niagara Group, in Ripley County, Indiana.

### HOLOCYSTITES ORNATUS, n. sp. (Plate V., figs. 3, 3*a*, 3*b*.)

Body somewhat obovate, depressed on the anterior side. There are eight hexagonal plates in the first range; four of these on the anterior side are twice as long as wide; the others are nearly as wide as long. These plates are very much constricted, which indicates that the body was possessed of a small column. The fossil rapidly enlarges at the second range, which consists of eight plates, varying in form from pentagonal to heptagonal. The plates do not seem to be disposed in any determinable order above the second range, though if arranged in courses, there would be about ten between the column and the arm plates; neither have they any regularity in form or size. The ambulacral orifice is situated upon the summit, near the posterior margin; it is somemhat elongated, surrounded by seven plates, and four (possibly five) arm bases. The mouth is situated upon the summit, two plates distant from the ambulacral orifice; part of it is broken away in our specimen, but it seems to have been surrounded by five plates. A small anal opening exists in the top of a pustule between the ambulacral orifice and the mouth. The pustule is situated on the right side of the plate, adjoining the mouth and close to an arm base, being nearly in the centre of the summit.

The surface is very strongly granulose, or pustulose, and each plate is perforated by numerous pores. The pores open upon the summit of the granules, and where the granules are worn off, the plates show the pores, in pairs, passing through to the interior.

Length of specimen, one and five eighths inches; greatest diameter, a little over an inch.

Collected by Frederick Braun, Esq., in the lower part of the Niagara Group, in Jefferson County, Indiana.

### HOLOCYSTITES PERLONGUS, n. sp. (Plate V., figs. 4, 4*a*.)

[Ety.—*perlongus*, very long.]

Body very long, sub-cylindrical, and very gradually enlarging from the column upward about one third the length of the body. Summit rounded; central part covered with a large heptagonal plate; five plates abutting this central one are pentagonal and gradually slope off in all directions; the other two form part of the margin of the ambulacral orifice. The ambulacral orifice is situated on the left side of the summit, at the margin; it is sub-elliptical in outline and surrounded by five free arms. The thickening of the plates around this orifice gives the fossil the appearance of a slight prolongation to the left. The mouth is situated upon the anterior side two plates distant from the central one, at the apex, and separated by two plates from the ambulacral orifice. It is sub-elliptical and surrounded by five plates. The body is covered with fifteen or more irregularly disposed ranges of plates. The plates vary greatly, in size and shape. A range of large plates, eight in number, surrounds the body above the middle; part or all of these have nine sides; the next range below seems to be composed of twenty pentagonal plates, but the anterior side of the specimen examined is injured so as to prevent us from certainly ascertaining the number. The plates in other ranges vary in number, size and shape, so that we may say the plates, in the fifteen ranges, vary from seven in one range to twenty in another, and in form, from a triangle to a nonagon. The illustration shows their appearance on the posterior side.

The surface is strongly granulose and each plate is perforated with numerous pores. The pores open on the summit of the granules. No anal aperture. Column unknown.

The specimen illustrated has a length of four inches, and it would require one or more ranges of plates to complete it down to the column. The circumference, immediately below the mouth, where the plates are all preserved, is three and eight tenths inches; the diameter from the anterior to the posterior side nearly an inch, and the transverse diameter one and three tenths inches.

Collected by Prof. A. G. Wetherby, Frederick Braun, and the author, in the lower part of the Niagara Group, in Ripley County, Indiana.

### Holocystites globosus, n. sp. (Plate V., figs 5, 5*a*, 5*b*.)

Body sub-globose. Basal pieces, apparently seven, but I am by no means certain that this is correct. Between the basals and the first range, on the posterior side, three small plates appear to be inserted, two of which are pentagonal, and the other triangular. The body is covered, between these pieces and the arms, with four ranges of eight plates each. In the first range, part of the plates are pentagonal, the others hexagonal; in the other three ranges the plates are hexagonal. The ambulacral orifice is situated at the apex, and is surrounded by six plates arranged within four arm bases. The plates surrounding the orifice are narrow, pentagonal or hexagonal, and elevated so as to support the arm bases. Between the arm bases on the one hand, and the plates surrounding the ambulacral orifice and the first range below the arm bases on the other, a small pentagonal plate fills the area; these four plates with the four arm basals make eight plates in this range. The mouth is situated two plates distant from the ambulacral orifice, and just without a line drawn from one arm base to the next adjoining.

The body is quite ventricose, near the base on the posterior side, and is slightly swollen below the mouth, on the anterior side.

The surface is slightly granulose. All the plates are poriferous. No anal aperture.

The specimen illustrated is about one and one fourth inches in length, and about an inch in diameter. The greatest diameter is found in a line drawn from the left side to the right, cutting a line at right angles, passing through on the right side of the mouth and left side of the ambulacral orifice.

Collected by Frederick Braun, Esq., in the lower part of the Niagara Group, in Jefferson County, Indiana.

### HOLOCYSTITES PUSTULOSUS, n. sp. (Plate VI., figs. 1, 1*a*.)

[Ety.—*pustulosus*, full of pustules.]

Body somewhat obovate, and obscurely triangulated toward the summit. It is covered by numerous, somewhat irregularly disposed convex plates, which differ much in size and shape, and constitute about ten ranges; the larger plates approach the summit.

The ambulacral orifice is situated in the central part of the summit, directly in the rear of the mouth, and is surrounded by five strong arm bases.

The mouth is situated in a depressed area near the margin of the summit.

A small anal aperture is situated between the mouth and the ambulacral orifice, at the foot of an arm base, and to the right of a line drawn from the center of the mouth to the center of the ambulacral orifice.

Surface marked by strongly convex plates, covered by many pustules, and perforated by numerous pores. The pores open upon the summit of the pustules, and where the pustules are worn off, the pores may be seen in pairs, passing to the interior.

Length of specimen, two and two tenths inches; circumference, five and nine tenths inches; diameter from the anterior to the posterior side, one and nine tenths inches; and transverse diameter about the same.

Collected by Dr. R. R. Washburn, in the middle or lower part of the Niagara Group, a few miles from Waldron, Indiana.

### HOLOCYSTITES PLENUS, n. sp. (Plate VI., figs. 2, 2*a*.)

[Ety.—*Plenus*, full, large.]

Body large and sub-cylindrical. The upper part only of our specimen is preserved, and the right side of it is somewhat injured. The summit is convex and covered with large plates. One capping the apex is hexagonal; bounded on two sides, by plates reaching the ambulacral orifice, on two sides, by two large plates, supporting part of the arm bases, and on the remaining two sides, by two plates constituting part of the first range below the summit.

The ambulacral orifice is large, sub-pentagonal, and surrounded by five strong arm bases. It is situated upon the left side, at the margin of the summit, which is prolonged, in that direction, so as to produce a concave side on the left, below the arm bases, and to give the opposite or right side of the body a longitudinal convexity. The arms seem each to have rested upon three plates, and if this supposition is correct, the orifice is surrounded by ten pentagonal plates. Five plates fill the spaces between the larger plates supporting the arm bases and the first range of plates below the summit, one of which is described above as capping the apex, and another forms part of the mouth. A small anal aperture is visible, at the foot of the arm base, posterior to the mouth, and nearly in a line from the posterior part of the mouth to the upper part of the ambulacral orifice. The mouth is surrounded by five plates, and is separated from the ambulacral orifice, by a pentagonal plate, which, on one side, constitutes part of the mouth, and which is supported, upon two sides, by the adjacent plates forming the rear part of the arm bases, and upon the other two sides, by two plates, each of which forms part of the ambulacral orifice as well as part of the support for the arm bases.

The first range of plates below the arm bases passes up over the right side of the summit, having an inclination to the body of the fossil of about forty-five degrees. This range consists of eight large pentagonal plates, one of which forms the lower part of the mouth. The plates, in the next three ranges, are large, but seem to become more numerous, and to vary in form and size. The injury to the right side above mentioned, prevents us from accurately determining the number and form of the plates in these ranges.

The surface is slightly granulose, and all the plates are poriferous. The circumference of the specimen at the lower part of the second range of plates below the arm bases is 5½ inches ; the diameter from the anterior to the posterior side, 1 85-100ths inches; transverse diameter, or diameter from the left to the right side one and one half inches.

Collected by Frederick Braun, Esq., in the lower part of the Niagara Group, in Jefferson County, Indiana.

### HOLOCYSTITES ELEGANS, n. sp. (Plate VI., figs. 3 and 3*a*.)

[Ety.—*Elegans*, elegant.]

Body quite irregular in shape; from the column toward the summit, it is somewhat obconoidal, with one side much more rapidly expanding than the other; approaching the summit it becomes sub-quadrate The summit is moderately convex. The body is covered by numerous plates, which, if regularly disposed, would constitute not less than ten ranges. They are so closely anchylosed, in our specimen, that they can not be accurately counted. Some of the ranges, and particularly those surrounding the sub-quadrate part of the body, must contain at least twenty plates, and probably more. None of the plates are very large.

The ambulacral orifice is very large, and situated a little anterior to the central part of the summit. It is surrounded by eight plates, five of which support arm bases.

The mouth is situated near the anterior edge of the summit, a little to the left of a line drawn through the middle of the body. No anal aperture discovered.

The surface is granulose and all the plates are poriferous. In addition to the minute pores which penetrate all the plates, there are a number of large circular openings irregularly dispersed over the summit, sides and posterior part, down to the column. Some of these openings are found at the junction of two or more plates, in other cases an opening passes through the central part of a single plate. None of of them seem to be pectinated, and we are at a loss to determine what function should be ascribed to them, or what name they should bear.

The round apertures, upon the summit of *H. Wetherbyi*, seem to be of the same character, but as they are not so numerous and are confined to the immediate locality of the larger apertures, their functions may have been different.

Length of specimen one and one half inches; circumference five and one tenth inches; diameter from the anterior to the posterior side one and six tenths inches; transverse diameter one and one half inches.

Collected by Frederick Braun, Esq., in the lower part of the Niagara Group, in Jefferson County, Indiana.

## *REMARKS ON SOME LAMELLIBRANCHIATE SHELLS OF THE HUDSON RIVER GROUP, WITH DESCRIPTIONS OF FOUR NEW SPECIES.*

By R. P. Whitfield.

I lately received from Prof. J. Mickleborough, of Cincinnati, Ohio, several examples of Lamellibranchiate shells, collected from the softer clay layers of the Hudson River Group, in the vicinity of Clarksville, Clinton Co., Ohio, with a request that I would determine their specific relations.

On examination, I find some of them presenting features of considerable interest, as showing the great degree of compression, or distortion, they have undergone, during the consolidation of the material in which they were imbedded; and showing, what appears to me, proof of the great amount of vertical compression, or shrinkage, which had taken place in some of the softer layers of the formation before they became finally fixed or hardened. Sufficient, as the examples show, to produce an imperfect slaty lamination through the substance of the fossils.

One of the examples referred to, is a large specimen of *Cypricardites Sterlingensis* (?) M. & W., which in its perfect uncompressed condition, must have had a thickness, measured through the body of the valves, of at least one and one fourth inches, which has been reduced by compression to eleven sixteenths, or little more than half an inch. The specimen has been imbedded in the shale with the plane of the valves corresponding to the plane of stratification, thus bringing the compression nearly or quite vertical to the longer axis of the shell, thereby reducing the thickness to nearly one half its original dimensions, without materially distorting or altering the general outline of the shell; presenting in this condition, features, which would, under ordinary circumstances, be considered as of specific importance. All parts of the shell are proportionally reduced in one direction, while retaining their normal characters in the other. Other examples in the collection sent, seem to have been imbedded in an opposite direction to the one above mentioned; and these have been compressed in the direction of the longer axis of the shell, thus reducing the length of the shell very materially, while the thickness and height retain their normal proportions. Lamellibranchiate shells are particularly liable to this kind of distortion, especially when imbedded in argillaceous or shaly rocks, and require the exercise of considerable judgment in determining their specific relations, as they are liable to present very different characters, even when specifically identical. Where the pressure is oblique to the axis of the shell, it is readily detected. Among those sent for identification, I find the following new forms, which are sufficiently marked to be characterized as species:

CYPRICARDITES QUADRANGULARIS, n. sp. (Plate VI., fig. 5.)

Shell rather above a medium size, somewhat quadrangular in outline and very erect, with prominent, incurved and sub-central beaks which overhang the proportionally large ligamental areas. Height of the shell, in the example used, slightly greater than the length in an anterior and posterior direction. Cardinal line short, less than half as long as the shell below. Valves moderately convex, and apparently quite prominent along the distinctly angular umbonal ridge; regularly convex anterior to the ridge, and slightly flattened on the postero-cardinal slopes. Anterior margin rounding from the hinge extremity to the postero-basal angle, with a nearly regular curvature; and from this point to the posterior extremity of the hinge has been nearly vertical, the border having only a slightly convex outline. Surface of the valves marked by closely arranged concentric lines of growth, which form slight undulations of the surface by their irregularity.

This species differs from any other of the Genus yet noticed, in the extremely erect form, prominent beaks and quadrangular aspect of the outline. The example used in description has been obliquely crushed, distorting the shell in such a manner as to shorten the right valve on the anterior side of the umbonal ridge, and the left valve on the posterior side; the entire length probably having been somewhat reduced, while the height has not been materially changed. Other individuals of the species may probably show the height and length to be nearly equal, or the length may possibly slightly exceed the height. The prominent beaks, elevated more than one fifth of the entire height of the shell above the hinge, together with the short cardinal line is a rather marked feature. In the general aspect, the species has much the appearance of the forms referred to the genus *Anodontopsis*, McCoy. But the existence of a distinct and well marked cardinal or ligamental area at once places it with *Cypricardites.*

Formation and locality: In the soft shales of the upper part of the Hudson River Group, Clinton Co., Ohio.

CUNEAMYA CURTA, n. sp. (Plate VI., figs. 6, 6*a*.)

Shell of medium size, rotund or sub-globose in general form, and abruptly cuneate posterior to the umbonal ridge when viewed from above. Height and length sub-equal in the example used, which shows evidence of considerable shortening by compression. Valves very ventricose, prominent on the umbones, with large closely incurved beaks, situated very near to the anterior end of the shell, but yet not quite terminal. Cardinal line two thirds as long as the entire length of the valve in its present shortened condition, and margined by a very distinct and proportionally wide escutcheon like area of lanceolate form. Margin of the shell arcuate from the anterior extremity of the hinge, including the anterior and basal borders, the latter more sharply rounded in the unnaturally shortened condition of the specimen, than the anterior, while the posterior is somewhat more extended and again recurved to the extremity of the hinge just below the cardinal line. Anterior end of the shell marked by a rather large and distinct lunule. Surface marked only by concentric lines of growth, which are grouped to form slight undulations on the surface of the shell. Were it not for the distinctly formed lunule and escutcheon, we should be inclined to place this species under the genus *Leptodomus*, McCoy; but these characters readily distinguish it from the more typical forms of that genus, and ally it strongly with *Cuneamya*, from which it differs only in the extreme shortness of the shell. This has, however, been produced, to a considerable extent, by compression in the longer axis of the valves; and we should judge from the evidence furnished by the specimen, that this shortening has been equal to nearly one third of its present length. The rounded form and great rotundity of the valves are prominent features, and will serve to distinguish from any other described form.

Formation and locality: Found in the soft shales of the upper part of the Hudson River Group, in Clinton Co., Ohio.

### ORTHODESMA MICKLEBOROUGHI, n. sp. (Plate VI., fig. 7.)

Shell of medium size, trapezoidal or sub-rhomboidal in outline, with angular, ventricose valves, which are twice as long as high. Beaks small, not very prominent, situated not more than one fifth of the entire length of the shell from the anterior end, incurved, approximate and sharply angular on the back. Cardinal line about three fourths as long as the shell, and distinctly arcuate; anterior end short, the point of greatest length being but little below the cardinal line, and the margin below this point directed obliquely backward, at an angle of from forty-five to fifty degrees with the cardinal line, to its junction with the basal margin; basal line sub-parallel to the cardinal line, and broadly sinuate at, or just posterior to, the middle of its length. Posterior end obliquely truncate, rapidly receding from the extremity of the hinge to the sharply rounded postero-basal angle. Posterior umbonal ridge prominent, angular throughout, but becoming more decidedly so near the beak and at the postero-basal angle, causing a downward projection of the shell margin; anterior umbonal ridge rounded, but quite defined; cardinal slope abrupt and slightly concave, becoming nearly vertical along the umboes. Body of the valve broadly sinuate between the anterior and posterior umbonal ridges, and the anterior end abruptly stopping.

Surface of the shell marked by numerous, distinct, concentric undulations, with the appearance of fine, radiating lines, which seem to have formed elongated pustules along the posterior umbonal ridge in the more advanced stages of growth.

This species is a very marked one in its general form and rhomboidal outline, as well as in the general expression of the surface. It is closely related to *Orthodesma contracta*, Hall sp., from this same horizon, but may be readily distinguished by the shorter anterior end, more angular beaks, and by the longest point of the anterior extremity being situated near the cardinal line, instead of below the middle of the shell, as in that species.

Formation and locality: In the Hudson River Group, at Cincinnati, Ohio. The specimen was found near the top of the hills back of the city, about 360 feet above low water mark of the Ohio river.

### SEDGEWICKIA (?) LUNULATA, n. sp. (Plate VI., figs. 8, 8*a*.)

Shell small, irregularly sub-ovate in outline, and quite ventricose; with large, tumid, sub-central beaks: length equal to about once and a half the height. The hinge line on what we have considered the posterior side, is straight, and almost half as long as the entire length of the shell, but without any appearance of an escutcheon, and showing, to a slight degree, evidence of an external ligament, extending nearly its entire length. On the opposite (anterior) side of the beaks, the cardinal line slopes rapidly toward the base, contracting the height of this side to about half that at the beaks, and is deeply excavated, forming a very large and deep lunular cavity, below which the extremity is narrowly rounded to the basal line. Base nearly straight along the middle and for half the length of the shell, and rounding abruptly to the hinge on the larger (posterior) end.

Surface of the shell marked by rather large, concentric undulations, which become strongly developed as they approach the margins of the lunule; and also by finer intermediate lines of growth.

This species is undoubtedly congeneric with those forms described by Prof. Meek, from these same rocks, and referred with doubt to the genus *Sedgewickia*, McCoy, but we do not think them generical with the typical forms of that genus as illustrated by its author, taking the earliest species given; but as we know of no established genus to which they are more nearly related, and as they are not sufficiently well defined to afford a clear generic diagnosis, we prefer to place this one under the same generic designation, provisionally, rather than attempt to form a new group on insufficient material. We are, however, quite confident, that when properly understood they will form a very distinct genus.

Formation and locality: Found in the soft shales of the upper part of the Hudson River Group, in Clinton Co., Ohio.

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## *ON PRONUBA YUCCASELLA (RILEY), AND THE HABITS OF SOME TINEINA.*

By V. T. Chambers.*

In the *Transactions* of the St. Louis Academy of Science, vol. 3, p. 568, which I have just received, is a paper which perhaps requires some response from me. It is entitled "Further Remarks on *Pronuba yuccasella*, and on the pollenization of yucca," and is from the pen of my friend, Mr. C. V. Riley, State Entomologist of Missouri, and chief of the U. S. Entomological Commission, popularly known as the "Hopper Commission," and like other things, from the same distinguished source, is marked by ability and accuracy, as well as by a somewhat *ex cathedra* enunciation of opinion. I will not, however, quarrel with him for that; he is the founder of the very interesting genus and species, *Pronuba yuccasella*, and naturally enough seems to feel a sort of paternal solicitude for his scientific progeny; and woe betide the unlucky wight who ventures to trespass on this, his own peculiar demesne, as others beside I, and notably Prof. Zeller and poor Mr. Boll, have feelingly discovered even in this very paper in the St. Louis *Transactions*. Indeed, in consideration of the punishment meted out to Prof. Zeller and Mr. Boll, I ought, perhaps, to thank Mr. Riley for letting me off with simply, as it were, an admonitory spank. But enough of this badinage. Entomologists are said to be a peculiarly waspish people, the aculeate hymenoptera of mankind. Do but look at one, and the barbed aculeus shows its threatening point. Lest, therefore, Mr. Riley should misapprehend the spirit in which I write, and be tempted to administer something more than an admonition, I desist.

In his 5th Report, as State Entomologist, Mr. Riley describes *Pronuba yuccasella* as "having the front wings uniformly silvery white." In vol. 3, of the *Bulletin* of the U. S. Geological and Geographical Survey of the Territories, I have mentioned the occurrence in Colorado of numerous specimens having the wings more or less spotted with black; and in the paper in the St. Louis *Transactions*, before mentioned, Mr. Riley denies that the spotted specimens belong to *Pronuba*, and states that they belong to the species described by me, before that time, as *Hyponomeuta 5punctella.*

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*[Read at the November, 1877, Meeting of the Cincinnati Society of Natural History.]

I found the specimens, spotted and unspotted, abundant when in Colorado, but I have none now in my collection. Of the many specimens observed by me then I kept but twenty-five, and on my return to Kentucky I found all of these but six ruined. These six I, through Dr. Hagen, donated to the Cambridge Museum, and at my request, Dr. H. submitted them to Mr. Riley for examination, who, admitting that a single female belongs to *P. yuccasella*, assigns the other five to *H. 5punctella*, as before stated. I am not, therefore, prepared now to assert positively that these five belong to *P. yuccasella.* I am, however, very confident that whatever they are, they are not *H. 5punctella.*

To refer these five, and all of the numerous spotted specimens observed by me in Colorado, to *5punctella*, would be to assert for that species, hitherto not observed to vary at all, a greater amount of variation than I have asserted to exist in *P. yuccasella.* The Colorado specimens referred by me to *P. yuccasella*, and by Mr. Riley to *H. 5punctella*, varied in the number of black spots on the wings from 0 to 13 ; and when all were present were arranged as in figure 1; but there was no variation whatever in the *position* of any spot. Of the six specimens now in the Cambridge Museum, and which have recently been inspected by Mr. Riley, one is unspotted, and is admitted to be *P. yuccasella ;* of the remaining five, one has a single spot, another has three spots, and the others are immaculate, as I learn from Dr. Hagen. I do not know the position of the spots in the two specimens; but when all the spots are present, at least in all the specimens examined by me in Colorado, which had the thirteen spots, their position was invariably as shown in fig. 1. No. 3 is the spot which is most often present. Nos. 6 to 13 inclusive are next in the frequency of their occurrence, whilst Nos. 1, 2, 4 and 5, are frequently absent. The number of the spots is thus very variable, but their position, when present, is constant; but a large proportion of the specimens were immaculate.

*H. 5punctella* was described by me from eight specimens received from Texas, and these are the only extant specimens. Mr. Riley has seen *one* of these eight, and has identified the five Colorado specimens with it, either by comparison with this one, or by comparison of them with my description of this species. In these eight specimens I observed no variation whatever in either the number or position of the spots, which are represented in fig. 2. A comparison of figs. 1 and 2 shows at a glance the difference in the positions of the spots. *No.* 3 *is the only spot which is common to the two species.* No specimen of *H. 5punctella*, seen as yet, has any spot but the five, and all of them have the five located as in fig. 2, and thus it has none of the thirteen spots of the Colorado specimens, except No. 3, while none of the Colorado specimens have any of the spots of *5punctella*, except No. 3, even when the spots number as many as thirteen.* So the eight specimens scarcely varied as to size, while the Colorado specimens range from less than six lines in expanse of wings, to ten or more. The species thus resemble each other, and other *Hyponomeutidæ*, in being white with black spots, which are sometimes absent from the wings of the Colorado specimens; they differ in the number and position of the spots, in the fact that *H. 5punctella* is constant in this respect, while the Colorado specimens are exceedingly variable, not only as to the spots, but as to the size. No inference that the insects belong to the same species can be drawn from the fact that spot No. 3, at the end of the disc, is common to both; because it is common, not only to them, and numerous other species of *Tineina*, but also to many species of widely separated families of *Heterocera;* and this remark likewise applies to the row of spots around the apex (6 to 13, fig. 1), which, however, are absent in all the specimens of *5punctella.* It is, therefore, evident to me, that Prof. Riley is in error in referring the five Colorado specimens to *5punctella.* Is he equally wrong in denying that they belong to *P. yuccasella?* This question, however, can not be answered by argument, or by assertion, but only by examinations of specimens made; it may be by those "other observers," invoked by Prof. Zeller, for the study of *Pronuba.* I hope to have the opportunity to satisfy myself at least about it in Colorado next Summer, but until then must defer any attempt at a solution of the difficulty. Situated as I was, in Colorado, I could not, and did not, attempt to preserve any large collection of any one species, though in the case of this, the most abundant species that I found there, many were observed; of the comparatively few that I kept, many were destroyed before I reached home.

I have seen traces of *Pronuba* larvæ in seed pods of yuccas at various places in Colorado, but the only place where I collected the imago was *on the plains*, about nine miles north of Colorado Springs, and thence to five miles east of the mountains. It was there that I took the specimens referred by Mr. Riley to *5punctella.* Both the spotted and unspotted forms were found there, *in great abundance, always in company with each other—always in the flowers of the yuccas, never elsewhere—never engaged in feeding, always quietly reposing on the inside of the perianth.* I observed them as they sat in the flowers, and saw *no difference in their appearance, or in their position in repose, nor in their mode of flight when disturbed.* I took many specimens in collecting bottles, killed them, and examined the neuration of the wings of one specimen, which must have *happened* to be a *Pronuba;* many of the specimens showed the unmistakable palpi of the female *P. yuccasella.* My specimens were not all examined however with equal care, and it is *possible* that a more careful examination of every one of the numerous specimens might have shown that there were some specimens of a *Hyponomeuta* among them. I did, however, make a careful examination of many specimens, because as soon as I saw the spotted form it occurred to me just as it did to Mr. Riley, can it be a *Hyponomeuta?* I will not deny the *possibility* that I may have been too easily convinced that it was not; and, as already stated, the point can only be settled by observation, not by argument. What, then, it may be asked, is the force of the facts above referred to in italics? I do not pretend that they are conclusive of the question, especially when opposed to the positive statements of so competent an observer as Prof. Riley. Nevertheless, those facts, and many others yet to be mentioned, do have a bearing on the question, and their bearing will be readily admitted by all who are familiar with the habits of the *Tineina*, and the extent to which unity of habit obtains among species of many genera, *Hyponomeuta* among them. Calling attention, therefore, to the sentences above, in italics, I will add that my collection was made in that neighborhood during the Spring and Summer, during which time the greater part of each day was spent in collecting; that at the place where these species were taken, there was no vegetation other than cacti, grass and yucca. From three to five miles distant, *on the mountains*, were willows, poplars, oaks, and pines. This wooded region was my daily collecting ground, but occasionally I wandered out on to the plains. In this wooded region I took many other species, among them *Anesychia mirusella*, Cham., and *Harpalyce* (Cham. *nec. Streph.*) *tortricella*, species allied to *Hyponomeuta, but never a specimen of Pronuba yuccasella, nor of the species referred by me to that species, and by Mr. Riley to Hyponomeuta 5punctella*, Cham. This is not surprising as to *P. yuccasella*, because this was not the locality in which it might be expected to occur; but it is surprising if Mr. Riley is right in refering them to *Hyponomeuta*, because it was *just the locality where one might expect to find Hyponomeuta.** But, on the other hand, out on the plains, three to five miles away from the wooded region, where there was no vegetation but grass, cacti, and yucca, in the flowers of yucca, in company with *P. yuccasella*, and bearing a resemblance so close to it as to require great care and discrimination to distinguish them, are found the specimens which Mr. Riley refers to *Hyponomeuta 5punctella.* There is nothing surprising in finding *P. yuc-*

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* The sketch then made is now before me. It is unquestionably the wing of *P. yuccasella;* but unfortunately my notes do not show whether or not it was one of the spotted specimens.

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* And where in fact other species of *Hyponomeuta* were found.

*casella* there, because that is just the place, and the circumstances and the time when it should be expected to appear. But it is very surprising if the species is a *Hyponomeuta*, because, for reasons presently to be given, that was just the place and the circumstances in which it ought *not* to be expected. And yet, if Mr. Riley is right, and the six specimens seen by him being the criterion, not only is a *Hyponomeuta* found there, in the very domicile of *P. yuccasella*, *but in numbers five to one greater than P. yuccasella itself!—and greatly more numerous than any other species was found anywhere in Colorado!* But why, it may be asked, ought not we to expect to find a *Hyponomeuta* in such place and circumstances.

I have alluded above to the unity of habit among species of this genus. Every species of it, of which the larva is known, feeds as larva on exogenous vegetation, is gregarious, and makes much web. Every collector of these and other *Tineina*, knows that the place to look for a moth is about the food plant of its larva. I was collecting them daily at a time when I could scarcely have failed to find the web and larvæ if they had been there. No trace of either was ever seen in the wooded region, nor was a single specimen of the imago found there; nor was any trace of the web or larva found on the plains where the moth was so abundant. If the larva feeds on either yucca, cacti or grasses, it can not be gregarious, nor make a web (which I must certainly have found had it existed); and, besides, if it feeds on either of these classes of endogenous vegetation, it is the *only species of this* (or I may say of any other well limited and established genus of *Tineina*, such as *Hyponomeuta*) *which feeds on an endogen*, *while all the other species feed on exogens*, and is, besides, *the only recorded instance of a Hyponomeuta ever seen in a flower of any color!* If these specimens, then, belong to *Hyponomeuta*, they differ *tota cœlo* in habits and habitat, both as larva and imago, from every other known species of the genus, and not only so, but they violate the unity of habit which prevails so largely among species of so many genera of *Tineina;* and, already closely allied in structure and ornamentation to *Pronuba yuccasella*, it further mimics it in habit and habitat! A most astonishing case of mimicry.*

But Mr. Riley proceeds: "The spots on *Hyponomeuta* are very variable, while some individuals of *5punctella* are immaculate, when at first sight they might be mistaken for *Pronuba*." He has not been particularly happy in the construction of this sentence. It lacks his usual perspicuity, and leaves one in doubt whether it is meant to say that all *Hyponomeuta* are very variable, or only that *5punctella* is so. Either way I must dissent from the statement. The species of *Hyponomeuta* are not very variable in the number, and certainly not in the position of the spots. The Colorado species (if it is a *Hyponomeuta*) is an exceptional case. Some variability no doubt exists, as it does in almost all species (always in deference to Prof. Riley, excepting *P. yuccasella*). But when we consider the great number and small size of the spots in *Hyponomeuta*, the wonder is that there is not more variation, especially as to the position and size of the spots. In England three allied species of the genus are found feeding on the same plant (*euonymus*), yet there is no difficulty in distinguishing them. On the other hand, *P. yuccasella* is a single species of a somewhat anomalous genus, and notwithstanding the light which has been shed upon it by Mr. Riley, " dark lanthorn," much no doubt yet remains to be chronicled by " other observers," and I should much sooner expect a wide range of variation in such an extraordinary creature, than in any species of the well known *Hyponomeuta.*

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* Mr. Riley gives the expanse of the wings of *P. yuccasella* 1 in. for the male, and .90 for the female. My Colorado specimens ranged from six to ten lines: twenty specimens, male and female, of the immaculate and undoubted *P. yuccasella*, taken by me in yucca flowers, in Kentucky, range from ten twenty-fourths of an inch to twenty-one twenty-fourths of an inch. Curious that the imitation should extend not only to the habit, habitat and ornamentation, but even to the variation in size!

But let us return to our alleged (by Mr. Riley) *5punctella.* We have seen where and under what circumstances it was found. How came it there? Its presence *in such numbers*, and *under all the circumstances*, these could not have been *accidental.* No doubt one frequently meets with a single specimen, or with a few specimens of a species at a considerable distance from any known food plant of the species; but then such specimens are as likely to be found in one place as in another; and are not found in great numbers, and only in the flowers of a single plant, and in company with a species which so closely resembles them; and, besides, such cases are sporadic, not epidemics as in the case we are discussing. The presence of such numbers of the supposed *Hyponomeuta*, five to one more numerous than *P. yuccasella* itself, in a particular locality, in the flowers of yucca, in company with the so-closely-resembling *Pronuba*, and in the absence of every other species, and at such a distance from every kind of vegetation upon which allied species of *Hyponomeuta* feed, either in the larvæ state, or as imago, in the absence too of all evidence that it feeds in any of its states upon yucca flowers, and even occupying the same position in repose in the flowers that the true *Pronuba* does, calls for some explanation different from that which might be satisfactory, if it was an instance of the chance happening of one or of a few specimens under ordinary circumstances. So also the total absence of the species in all of its states from the wooded region, when by every analogy drawn from the history of kindred species, it might be expected to occur, and the absence of all evidence that its food plants and habits as to food differ from those of kindred species calls for a like explanation. What explanation can be offered? Does it aid in the fertilization of the flowers? Mr. Riley has hitherto claimed for *P. yuccasella* alone, the office of marriage priest to the yuccas. Does the larva feed in any way upon the plant? With all Mr. Riley's diligent observations upon yucca-feeding insects, he has failed to discover this larva, notwithstanding the abundance of the imago. Does the imago feed in the flowers? There is no evidence conducing to establish the fact. In no instance was it observed feeding, but always quietly reposing, like *P. yuccasella*, in the same position with it, and in company with it within the perianth. Was it there for protection? And does it again return to the wooded region where nobody ever saw it, to oviposit, where its invisible larvæ feed on invisible leaves, construct invisible webs, and in time produce moths which are never seen except in the flowers of the yucca, miles away?

But Mr. Riley has foreseen the difficulty; he has foreseen the necessity of accounting for the presence of the *Hyponomeuta* in yucca flowers, with *P. yuccasella*, and under all the circumstances above detailed. His explanation is that " white moths are *naturally* attracted to white flowers, and it is rash to assume, without careful examination, that all white moths found in yucca flowers are *Pronuba*." I have made no such assumption in so many words. If I have made any assumption, it extends no further than these particular moths. But, in point of fact, no white moths, other than these (including the true *Pronuba*) ever have been found there; that is a fact, not an assumption. "White moths are *naturally* attracted," etc., no doubt, if they are attracted at all. "Naturally" explains this phenomenon in the same way that the word "gravitation" explains why a stone falls. It is a word to cover our ignorance of a *vera causa*, and to my mind, the sentence just quoted from Mr. Riley reads much more like a deduction from some theory of "protective resemblance," or mimicry, than like an induction from observed facts; and whatever may be true of other moths, I assert, without hesitation, as to the *Tineina*, that white moths are *not* naturally attracted to white flowers; exactly the reverse is the case. *It is a most extraordinary circumstance to find a white moth of this family in a white flower, or on a flower of any kind.* If Mr. Riley is right in referring these specimens to *Hyponomeuta*, it is the first recorded instance in which a *Hyponomeuta* has ever been found in a flower, white or colored. Nay, further, excepting these Colorado species, and the European *Anesychia decemguttella* (to which I shall refer again further on), two, or at most three, species, no white moth of the family *Tineina* has ever been recorded as being found on or in a white flower. If a single such instance occurs, I have not been able to find a reference to it. But, again, *Blastobasis gigan-*

*tella*, Cham., is a large and conspicuous white moth, found within a few miles of the place where these specimens were taken, and found only upon the yucca, but always resting on the green leaf blades, never in the white flowers.

*Coleophora argentella*, Cham., and *Coleophora bistrigella*, Cham., are large, showy, silvery-white moths, found in the wooded region near where these specimens were taken, and at the same time. Why are they not naturally attracted to the white flowers? So as to *Coleophora basistrigella*, *C. artemesicolella*, *C. sparsipulvella* and *Bucculatrix staintonella*, all found in that same region, all white moths, but none of them ever found on white flowers. The fact is, the *Tineina* do not frequent flowers. In the course of ten years of active collecting, and of observations on this family, I have been frequently impressed with this fact; and as to the great majority of species, I have been led to doubt greatly whether they feed at all in the imago state. The few species that do frequent flowers, so far from seeking flowers of their own color, *exhibit a marked contrast with the color of the flowers on which they are found. Coleophora sparsipulvella* above mentioned, is found occasionally on the brown flower heads of *Helianthus. Glyphipteryx montisella*, which is bronzy-gray, mottled, with white and bright metallic tints, also feeds on the flowers of *Helianthus.* In the Mississippi valley, the purplish-bronze *Adela bella* is found on the white flowers of *Celastrus scandens;* the purplish-bronze *Butalis flavifrontella*,* *B. matutella*, and *Coleophora corruscipennella*, are found on the white flowers of asters. *Out of more than eight hundred species of Tineina already known in this country, these just named are the only species that have ever been found on flowers of any color. Pronuba yuccasella* is the only white moth that has been found in this country on a *white* flower, unless Mr. Riley is right in referring the specimens found by me to *Hyponomeuta.* The only other white moth found in this country on flowers is *Coleophora sparsipulvella*, above mentioned, and that is found, not on a white flower, but on the brown flower head of *Helianthus.* In every other instance, the moth is of a purplish-bronze color, contrasting strongly with the white flower. It is the dark moths that are attracted to the white flowers, so far as there is any natural attraction in the case. I have mentioned *Anesychia decemguttella*, a European species. It is sometimes found in England on the flowers, and sometimes on the leaves of *Lithospermum.* The moth is whiteish, marked with black. I do not know the color of the flowers of the *Lithospermum.* It makes no difference what their color may be; the insect does not frequent them because of their color, but because *Lithospermum* is the food plant of the larva, just as *Pronuba yuccasella* frequents the yucca flower—not because they and it are alike white, but because it there deposits its eggs, and lives there in the larval state. Thus there is not in the whole family of *Tineina* a single instance where a white moth is naturally attracted to a flower because it is white.

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* Since this was written, I have also taken this species on flowers of *white* clover.

Thus far, these remarks apply only to American species. Let us now look to Europe. Running over the *five hundred and ninety species*, described as British, by Mr. Stainton, in the *Insecta Britannica*, vol. 3, in which notes of the habits of the species are also given, *only fourteen have been found on flowers of any kind. Anesychia decemguttella* above mentioned, is one of these, and is the only white one in the number; and we have just seen how and why it frequents the flowers of *Lithospermum.* Of the remaining thirteen, three are brownish golden species of *Micropteryx*, a genus known in this country only by a single little known and doubtful (?) species (*M. pomivorella*, Pack.) Two are greenish bronze species of *Asychna*, a genus not yet found in this country; two belong to *Coleophora;* both are of a greenish-bronze hue, and indeed, one of them, *C. fabriciiella*, has been recognized by Prof. Zeller as indentical with our flower-visiting species, *C, corrusoipennella*, Clem., above mentioned; two of them belong to *Glyphipteryx*, and are related to our *G. montisella*, mentioned above as found on *Helianthus*, in Colorado; and three of them belong to *Adela* —greenish or golden-bronze species, allied to our *A. bella*, above mentioned, as being found on *Celastrus;* while the remaining species belong to *Nematois*, closely related in ornamentation, and otherwise to *Adela.*

Thus, out of about one thousand four hundred species of *Tineina* described from this country and Great Brtain, only twenty-two, including *P. yuccasella* (and twenty-three, if Mr. Riley is right as to my Colorado species), have been found on flowers of any kind; of these twenty-three, only four are white species; three of these four are found on white flowers; two of these, *P. yuccasella* and *Anesychia decemguttella*, frequent these flowers, not because of color, but because they are the food of the larvæ, and the remaining species referred by Mr. Riley to *Hyponomeuta*, seems to be the only "white moth which is naturally attracted to white flowers." Truly it is a most provoking insect; if it is a *Hyponomeuta*, I suggest for it the specific name *paradoxica*, since it can not be *5punctella.* If it frequents flowers of *yucca*, because it is white, and is *naturally* attracted by this color, it is the sole species out of fourteen hundred which does so! If the larva feeds on yucca, it (if it is a *Hyponomeuta*) violates all the analogies and the unity of habit so prevalent in the genus and family, and is the only member of the family that feeds on an endogen, is not gregarious, and makes no web. At any rate, I fear that the statement that "white moths are naturally attracted to white flowers," is a "rash assumption, made without sufficient examination," at least so far as the *Tineina* are concerned. On the contrary, the inevitable conclusion is, that very few *Tineina* visit flowers at all; that a very few of these are white, that a great majority are of dark hues, contrasting strongly with the colors of the flowers on which they are found, and that they all belong to the following genera: ***Micropteryx***, ***Adela***, ***Nematois***, ***Butalis***, ***Glyphipteryx***, ***Coleophora***, and ***Asychna***, and visit the flowers to feed thereon, in the imago state, and that to these, we may add, ***Anesychia decemguttella*** and ***Pronuba yuccasella***, which visit them to oviposit, and which feed thereon as larvæ. Must we add our paradoxical species, which visits them in greater numbers than all the rest, for some unknown purpose, which it is to be hoped Mr. Riley will explain? Further, it is well known to all collectors of *Tineina*, that the moths may be looked for, with certainty as to finding them, at the proper time, about the food plant of the larva, and not elsewhere; that the abundance of the imago about a plant, especially when it is as conspicuous elsewhere by its absence, as it is there by its presence, is almost conclusive that it feeds in some way on that plant; and that when the species of a genus, and *a fortiori* a family are numerous, and have similar habits; when, for instance, as in *Hyponomeuta*, they are gregarious in the larvæ state, feeding on exogenous vegetation, and making webs, a species making no web, feeding on an endogen, with solitary larvæ, would to say the least of it, be regarded as an anomaly, if not a *lusus naturæ.* Certainly it would be a most wonderful creature if, in addition to these things, it mimicked in ornamentation, size, habit and habitat the species in whose habitat and company it is found, as closely as this species mimics *Pronuba yuccasella.*

On the other hand, if the species has the larval habits of *Hyponomeuta*, that is, is gregarious, makes webs, and feeds externally on exogens, then its presence *in such numbers*, and under all the circumstances, in the yucca flowers, with *P. yuccasella*, and miles away from all exogenous vegetation, is no less anomalous and surprising. If the specimens belong to *Hyponomeuta*, they are hedged round with inexplicable difficulties, which all vanish if they belong to *Pronuba.* The above remarks, as to the habits of *Tineina*, are not assumptions. They are well established facts, known to all students of the group. Neither can it be pretended that they are hasty generalizations, made without sufficient examination; for the relations of the *Tineina* to plants have received as much attention probably from specialists, as those of any other group of equal value among insects.

I have alluded above to the contrast between the ornamentation of the species above named, and that of the flowers which they frequent; but I do not wish to be understood as taking the position that there is no such thing as protective resemblance (the word mimicry seems objectionable) among insects. Every field entomologist knows that instances are common when the resemblance of an insect to its surroundings must in some degree protect it from its enemies, provided it has enemies of such kind as to make it need such protection, and provided those enemies have no better means of detecting its presence than poor human eyes afford, even when disciplined by years of habit and practice. Neither do I want to place myself in opposition to such naturalists as Wallace, Bates, Belt, Trimen, and a host of lesser lights who advocate some phase or other of a protective theory as connected with the evolution of species. It will not do, however, to assume because there is resemblance that there is necessarily protection from enemies in any given case, unless we know what the enemy is, and that the protection is necessary, and just how the resemblance operates to protect the species; and we have no reason to suppose that the species under discussion have any enemy from which they derive protection, either by their residence in yucca flowers, or by their resemblance to *Pronuba yuccasella.* It is a rash assumption that they frequent the flowers for protection, since there is no evidence that they have any enemy from which such protection is necessary; and since, if there is such an enemy, they would be exposed freely to its depredations; if they have the larval habits of *Hyponomeuta* on the first emergence of the imago from its pupa skin, in its web, in the wooded country, before it betakes itself to the plains and the yucca for protection; and, again, on its return to oviposit there. It must be a remarkable development of instinct which teaches a *Hyponomeuta* to forsake *en masse* the locality where the female oviposits, and the larva feeds, and betake itself to another habitat because it is white, and the flowers are white. Indeed, I find it difficult to believe that this species can have the larval habits of *Hyponomeuta*; and equally difficult to believe that a *Hyponomeuta* can differ so widely in habit and habitat from all other species of the genus for the sake of protection. or for any other reason. Beside, I find nothing in the natural history of *Tineina* to support any phase of a theory of mimicry or protection resemblance, whatever may be found in any other group of animals. Some dark-colored, nocturnal species, which hide in out-of-the-way places in daylight, may, thereby, escape some enemies, to fall perhaps into the jaws of others which love darkness like themselves. But great numbers of them are brilliant, gaily-colored little creatures, loving the sun light, resting upon palings, walls, trees and leaves, as if they sought to display their gay colors by the contrast.

The species of *Hyponomeuta* are white, adorned with small black spots to set off their white ground color to greater advantage, like the patch of an Elizabethan dame, or a modern belle, and contrast strongly with the dark surfaces of palings, and the bark of trees, where they are usually found resting. Neither can it be claimed for many of the gaily colored *Tineina* that they have any such means of protection as a disagreeable smell or taste, since many of them fall victims to predacious *Diptera*, saltatorical spiders, and larvæ of *Hemerobious* and *Chrysopa*, which frequent the same localities and prey upon them.

But I have gone much more fully into this subject than I intended. It is not my purpose in what I have written to attempt to establish by arguments from analogy what is properly matter of occular demonstration. But the facts that I have alluded to, and the conclusions drawn from them, seem to me to have a bearing on the question, and as many of them have not heretofore been published in a connected form, I have taken advantage of Prof. Riley's paper, *not for purposes of controversy*, but as a text for these remarks on the habits of these little moths.

There are, however, one or two other points in Prof. Riley's paper, apart from the identification of these species, to which I wish to allude.

Dr. Baird has somewhere (I write now from memory) advanced the theory or hypothesis, that the birds of the West are larger, with greater development of *peripheral* parts, and greater depth or intensity of color, than the equivalent species in the Eastern States; and Dr. Packard, in Hayden's Report, for 1873, had suggested that the same rule applied to insects; and in a paper in the *Bulletin*, before referred to, I had come to a different conclusion as to the *Tineina*. Commenting on this, Mr. Riley writes: "Mr. Chambers' premise being at fault, there is of course no force in what he says against the general rule laid down by Baird and Packard." What premise, may I ask, is at fault? *If* I had based my conclusion on the single instance of *P. yuccasella;* and *if* all the specimens examined by me, and referred by me to that species, had belonged to *Hyponomeuta*, then my premise would most certainly have been at fault. But that was not my premise, nor anything like it. On the contrary, many of my specimens had the unmistakable palpi of the female *yuccasella*, and one of those seen by Mr. Riley is admitted by him to belong to that species. Mr. Riley writes as if my conclusion, adverse to the hypothesis above referred to, was based upon the solitary case of *P. yuccasella*, and then says my premise is false, while he utterly overlooks the fact that in the very same paper in which I discuss this hypothesis (*Bulletin*, v. 3, p. 147), I passed under review all the known species (some seventy odd in number) of *Tineina* of Colorado; and while admitting that two or three species (notably *Blas-*

*tobasis gigantella*, with its long, narrow wings, and strong flight) seemed to support the hypothesis, yet the testimony of the *Tineina* generally was against it, though "the *Tineina* as a family is not well adapted either to the proof or disproof of it." The entire known species of *Tineina* of Colorado formed my premise—not *P. yuccasella*, Riley, alone; and I submit that the premise is not invalidated by what Prof. Riley has written about *P. yuccasella*. "But," Prof. R. writes, "the Colorado specimens (of *P. yuccasella*) are above the average size, which is *natural*,-since the capsules of *Yucca augustifolia*, in which the Colorado specimens breed, are larger than in other species, etc." Just as *natural*, no doubt, as it is for white *Tineina* to be attracted to white flowers. Is the size of an insect to be measured by the size of its food plant? Is a codling moth from a big apple *naturally* larger than one from a small apple? Nobody denies that a deficient supply of food may tend to dwarf an insect, or a man, but is the supply in the capsule of any species of yucca small enough to dwarf the moth? Beside, Prof. Riley's explanation of the alleged slightly-greater average size of the Colorado specimens—that it depends on the greater size of the seed capsules—does not in any way support the hypothesis (of Baird and Packard) alluded to, which has nothing to do with supply of food, in which respect western species certainly have no advantage over eastern ones, but is based upon supposed metereological and climatic causes; and Prof. Riley's language that "the Colorado specimens are, *if anything* a *little* larger," does not allow much for the in-

Fig. 1.

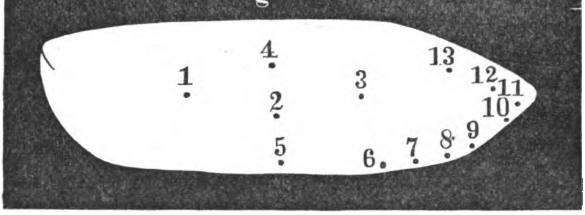
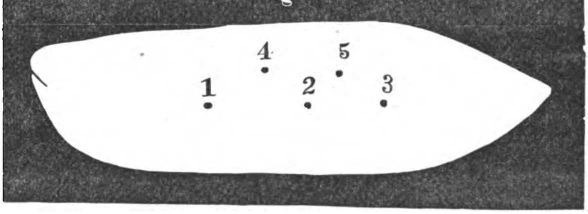


Fig. 2.



fluence of the supply of food, or indicate any very accurate measurement.

Prof. Riley seems to attach some importance to the fact that my remarks on the spotted form of *Pronuba* occur on "the very first page" of my paper in the *Bulletin.* I fail to see what difference it makes whether they occur on the first or the last. Prof. Riley is certainly familiar enough with the classification of the *Tineina* to know that *P. yuccasella* is the highest form treated of in that paper; and that arranging the species systematically, I began with the highest, *Pronuba*, and ended with the lowest, *Nepticula.*

*Explanation of the Figures.*—Fig. 1 shows the position of the spots in the Colorado species; fig. 2 shows the position of the spots in *Hyponomeuta 5punctella.*

The figures are not intended to show accurately either the form or neuration of the wings, only the position of the spots.

As to the Colorado species, I find in my notes the following statement in addition to what I have published in the *Bulletin* as before mentioned: "The vertex is somewhat roughened, the antennæ are not quite half so long as the wings, and have the apical half naked." In *Hyponomeuta*, and I believe also in *Pronuba*, the apical half of the antennæ is clothed with scales. I am not, however, certain as to this about *Pronuba*, of which I have no specimen now in my collection, and Prof. Riley makes no statement about it in his diagnosis of the genus. Nor do I know that my note applies to all the specimens examined by me. If it does, and the antennæ are clothed in *Pronuba*, the species taken by me would seem to differ in this respect both from that genus and from *Hyponomeuta.* In *Hyponomeuta* the antennæ are a little more than half as long as the wings, and the antennæ of *Pronuba* are said by Prof. Riley, in his diagnosis, to be not more than half as long as the wings. In *Hyponomeuta* the head is, as in the Colorado specimens, "somewhat roughened;" while in *Pronuba*, Prof. Riley says it is "sparsely haired."

## *ON THE DEFORMITIES OF SOME TENNESSEE HELICES.*

By A. G. Wetherby.

During the past season, while engaged in making collections on the Cumberland table-land of Tennessee, various species of *Helix* were found in the cliff regions to exhibit wide variation from the normal type. An instance of this may be found in the *H.* (*Triodopsis*) *ap-*

*pressa*, Say. Beside the forms familiar to our collectors about Cincinnati, there occurs one in the southern part of Kentucky, and which seems to be distributed down the Cumberland plateau and its outliers nearly to Emery Gap, smaller in size, thinner in texture and very heavily ribbed, like the *H.* (*Patula*) *alternata*, var. *mordax*, inhabiting the same range. As is the case with the variety of this species inhabiting our neighborhood, it is occasionally found about old logs, but its favorite station seems to be among the broken rocks forming the talus of the mountain cliffs. Here, in wet weather, they may be collected by thousands, as they could have been at one time on certain stone walls, and in certain cellars of this city; localities that, owing to the active search of unsatisfied gormands, have been practically exhausted, a fate luckily never in store for these mountain fastnesses.

In Union county, Tennessee, and extending southward through the great eastern valley, we find a very different variety of the same species. The shells are much larger than either of the other varieties, entirely wanting the ribbed character, and exhibiting much fainter lines of growth than characterize the Cincinnati form. This variety I found this summer inhabiting the caves and rock crevices of Lookout Mountain, where it is removed from its normal range. In considering the causes which have led to these wide variations, we may possibly account for the larger growth of the Cincinnati and East Tennessse Valley varieties, by quoting the old theory of limestone regions. I have elswhere shown, however, that many of our common species reach their maximum growth in sandstone regions, though the larger size seems to be somewhat compensated by the paucity of individuals. Even this rule fails, in fact, in many cases. But as to the cause of the development of the ribs, and the unnatural flattening of the spire, it is quite impossible to offer any certain conjecture. However, the result of an hour's collecting, in one of the many *tali* along the eastern front of the Cumberland plateau, presented a few curious features. These specimens were hastily and indiscriminately picked up from among hundreds crawling over the rocks, thrown into alcohol, and not examined until my return. So soon, however, as I began looking at them more carefully, I was struck with the number and extent of the deformities which the shells exhibited. The number of specimens is 129, and the number of deformities 43, or 33⅓ per cent. Many of the specimens exhibit two deformities, one of which affects one part of the shell, another quite a different part. I have, therefore, tabulated the injuries as follows :

1. Number of deformities of spire, 17.
2. " " " " umbilical region, 15.
3. " " " " aperture, 18.

4. Number of deformities of peristome, 22.
5. “ “ “ “ under surface, 12.
6. “ “ “ causing open umbilicus, 2.
7. “ “ “ “ double peristome, 2.
8. “ “ “ “ dwarf specimens, 2.

Under the first case the deformities consist of a depression of the spire, in some cases, and its unnatural elevation in others, caused by the crowding together of the whorls. In a few specimens, the center of the spire is depressed below the plane of the body-whorl. In such cases the injury to the shell occurred at a very early period, retarding the growth of the incipient whorls. After recovery, the healthy growth of succeding whorls overtops the spire. Damage occurring to the fourth whorl has caused the downward growth of the fifth, elevating the spire abnormally, and throwing the last suture below the central line of its whorl in the region of the aperture. This case is not uncommon, and the abnormal form arising from it seems to be perpetuated. In many instances the spire has been roughened, and the whorls abnormally angulated at certain points, damage from which they have entirely recovered further along in their growth.

Under the second case, the deformities consist of the abnormal depression of the umbilical region or the reverse. A prevention of the reflection of the peristome over the umbilicus, leaving it entirely open in two cases, and partial elevation of its edge in others, though not enough to expose the aperture.

Under the third case, the deformities consist of the abnormal thickening and roughening of the lip; of undue sinuosities; and of doubling in the two cases tabulated above. This thickening, in many cases, causes callosities on the lower third of the peristome, near the umbilical region. In the normal condition of the shell there is a lamellar tooth on this part of the peristome, which, being irregularly deposited, gives rise to the deformity mentioned. This case, also, seems to be perpetuated, and to have given rise to a wide spread variety, familiar to all students of this species. The fourth case is the result of the first and third. Abnormal elevation or depression of the spire, causing an unnatural angle of the terminal whorl, together with a sinuous peristome, have given rise to many curious forms of aperture. Thus, it is sometimes very unnaturally lengthened horizontally and depressed vertically; sometimes very much elongated vertically, and correspondingly shortened in the opposite direction. The angle at which the outer plane of that portion of the peristome above the aperture meets that below, varies from a right to a very acute one. These causes give rise to a very great variety of forms in the aperture.

Under number five the injuries have been such as already stated in the umbilical region, and various distortions, roughenings, and plications of the surface, resulting from fracture and repairs. In all these various cases the adult deformities have added the parietal tooth, the lamella to the peristome, and the widely reflected lip of the species. It now remains to discuss the causes of these injuries, and the probability of their genetic perpetuation. A talus of loose rocks, situated upon a declivity, is more or less constantly moving. If it has any period of comparative quiet, it is during the summer or dry season of the year. At all times there is more or less liability to damage, threatening the molluscan denizens of these protean retreats by the dropping of detached masses from the overhanging cliffs; and these masses are more apt to be detached during the wet season of the year, and especially in spring, after the freezing and thawing of winter, than at any other period. But this is precisely the time, also, when these creatures are most active, and have come from the deeper portions of the talus, a region of comparative safety, and are crawling over its surface.

In spring and winter, also, there is a sliding and moving of the whole mass by reason of the freezing and thawing, during the progress of which many of the shells are crushed and otherwise damaged. If, then, 33⅓ per cent. of specimens taken at random are so variously deformed, we may, perhaps, rightly infer that a long continuance and repetition of injuries of a like character, through many generations, would give rise to abnormal varieties. While accidental morphological characteristics are not likely to be perpetuated; and while general analogy stands in the way of the suggestion, the character of hermaphroditism, and the mutual fecundation of individuals abnormally alike, may present to such as choose to investigate this subject further, a key to some of the mysterious characteristics of this mountain molluscan fauna. At all events, we have numbers of specimens, entirely uninjured, exhibiting slight modifications of some of the characteristic deformities described above, and the constant repetition of accident renders the likelihood that its results will be persistently reproduced much more probable than in the accidental cases of deformity which we observe under ordinary circumstances.

Specimens are found with the spire very much elevated, the sutures abnormally impressed, and the general outline very different from that of the species in its ordinary form. Others are much flattened, more carinate on the body-whorl, and equally far removed from the types of the species. Beside, it is in these regions that we meet with the widest variation from the normal type, in many species, beside the one now under discussion. Here occur the carinate and flattened species of *Stenotrema*, the heavily ribbed and carinate species of *Patula*, and the only sharply carinate *Triodopsis*.

Among the first, the common habitat of the *S. spinosum* and *S. edgarianum* is between flat rocks, where I have often seen the former congregated by hundreds, the dead and living being found together in a common mass. Of similar habit, and associated with them, was the rare *P. cumberlandiana*, the rocks being apparently without any moisture, and the living snails having an epiphragm over the mouth of the shell, as during the winter period of hibernation. The least sliding of the rocks must damage numbers of specimens.

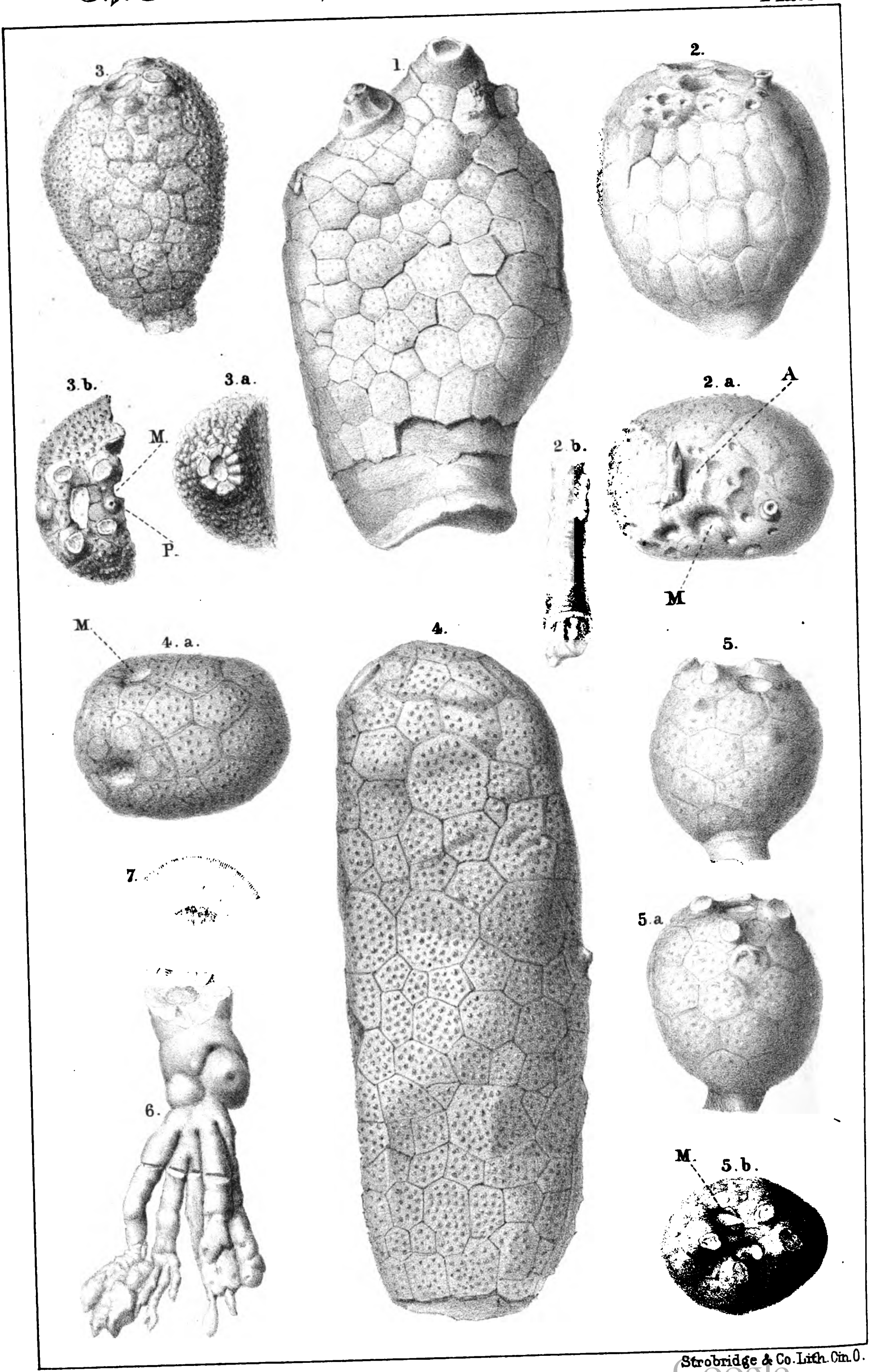
There is another evidence in favor of the inference which may be drawn from the facts given in this article. The species of *Stenotrema* not inhabiting such situations, exhibit none of these peculiarities. They vary in size, but there is no abnormal development or depression of the spire, nor any approach to the carinate types.

The *Patula* group presents the same fact, as the common *P. alternata* exhibits no wider variations in the mountain regions than characterize it elsewhere (the variety *mordax* not being included). Among the species of *Mesodon*, *Zonites*, *Triodopsis*, etc., the cases of abnormal variation are confined to coloration and size, and not to form, except in the case of the *T. obstricta* above noted.

Moreover, in regions remote from these influences, we do not find the number of varieties which here exist, and the species under any type, which are furthest removed from it, will be found in those localities where the liability to some accidental interruption of the ordinary process of growth becomes more frequent. While such circumstances of environment as may arise from sudden changes of climate, abundance or scarcity of food, the prevalence or absence of foes, and the multitude of other causes which are usually cited may have assisted in this work, I feel confident that we can trace to the more direct one of *habitat* the reason for many of the varieties in our Mollusca; nor would I confine these statements to the terrestrial tribes alone, but extend them to the numerous denizens of the mountain streams flowing through the same region, that have offered to the ambitious makers of species such an exhaustless fountain from which to multiply synonymy and confuse the true seeker after truth.

The wide range of varieties among the shells collected by Mr. Hemphill in the canons of Utah and Idaho, is very suggestive in this connection. There are, also, several species from mountain lands in Europe, of whose habits I know nothing, save that they are inhabitants of the Alps, Pyrenees and Carpathians, that differ so far from the type with which they are classed as to point in the same direction. Whether these cases are parallel or not, there is here abundant room for a speculation if for nothing more; and it seems that the weight of evidence is in favor of the suggestions which I have thus hastily indicated.

The Journal of the Cin. Soc. Natural History. Plate V.



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# *PLATE V.*

PAGE.

Fig. 1. HOLOCYSTITES BRAUNI—Natural size. Side view, . . . . . . 130

Fig. 2. HOLOCYSTITES WETHERBYI—Anterior view, . . . . . . . 131

*2a.* Summit view, with anterior side down. M, mouth. A, ambulacral orifice.

*2b.* Magnified view of what is supposed to be an arm, that is to be seen on *2a*, by the side of the ambulacral orifice.

Fig. 3. HOLOCYSTITES ORNATUS—Posterior view, . . . . . . . . . 132

*3a.* View of the base, showing the form of the plates, and the flattened anterior side, part of which is due to compression.

*3b.* Summit view. M, mouth. P, anal aperture.

Fig. 4. HOLOCYSTITES PERLONGUS—Posterior view, . . . . . . . . . 132

*4a.* Summit, bringing the anterior part more into view than the posterior. M, mouth.

Fig. 5. HOLOCYSTITES GLOBOSUS—Anterior view, . . . . . . . . 133

*5a.* Posterior view.

*5b.* Summit view. M, mouth.

Fig. 6. The root of a HOLOCYSTITES showing its crude branches.

Fig. 7. Part of the plate of a column, showing the fine lines which radiate from the center to the circumference.

# *PLATE VI.*

PAGE.

Fig. 1. HOLOCYSTITES PUSTULOSUS—Side and anterior view, . . . . . 134

1*a*. Summit view, showing ambulacral orifice, arm bases, mouth, and anal aperture. M, mouth.

Fig. 2. HOLOCYSTITES PLENUS—View of the left side, showing ambulacral orifice and arm bases, . . . . . . . . . . . . . . 135

2*a*. Summit view, showing ambulacral orifice, arm bases, and mouth. M, mouth. P, anal aperture.

Fig. 3. HOLOCYSTITES ELEGANS—Posterior and part of a side view. The specimen, in this view, is inclined forward; it would have been better if an upright view had been presented. It shows the anomalous circular apertures, . . . . . . . . . . . . . . 136

3*a*. Summit view, showing ambulacral orifice, arm bases, mouth, and anomalous circular apertures. M, mouth.

Fig. 4. Root, or termination of a column, of a HOLOCYSTITES coiled around another column, and terminating without branching.

Fig. 5. CYPRICARDITES QUADRANGULARIS, . . . . . . . . . . 138

Fig. 6. CUNEAMYA CURTA—Left valve, . . . . . . . . . . . 138

6*a*. Cardinal view.

Fig. 7. ORTHODESMA MICKLEBOROUGHI—View of the left valve, . . . . 139

Fig. 8. SEDGEWICKIA (?) LUNULATA—Right valve, . . . . . . . . 140

8*a*. Cardinal view.

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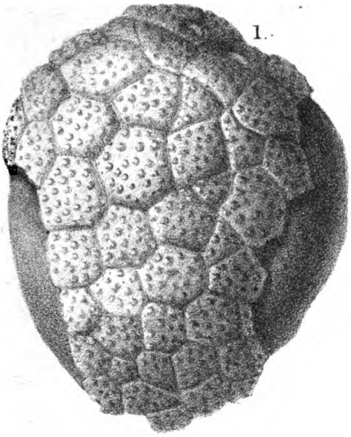
Plate VI.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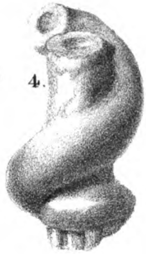
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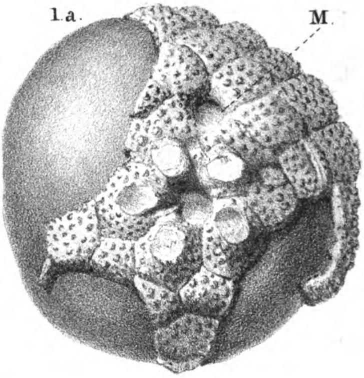
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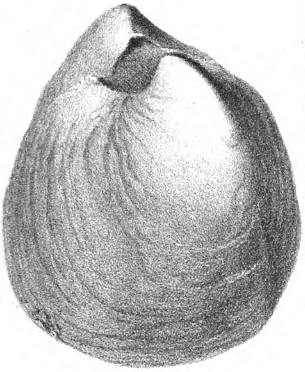
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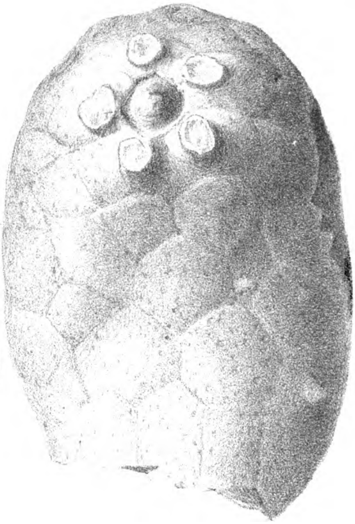
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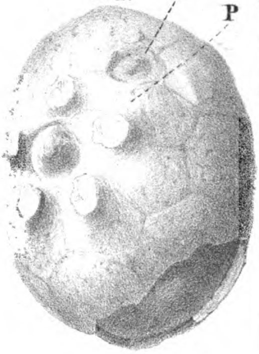
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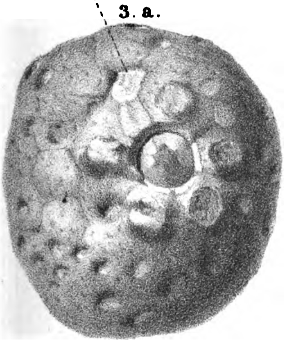
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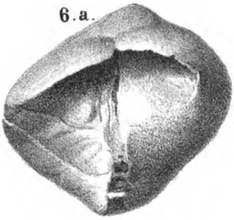
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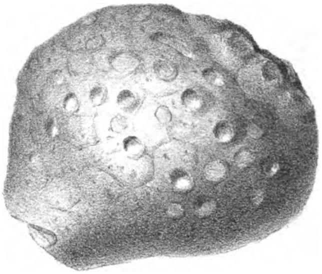
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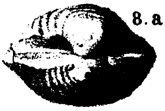
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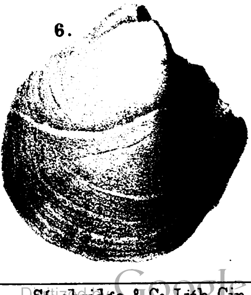
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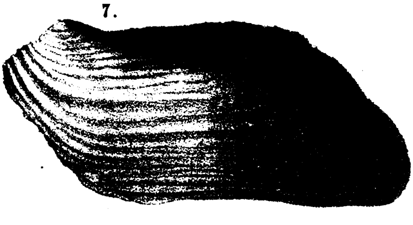
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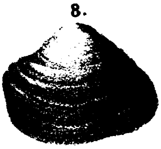
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